

American Journal of Obstetrics and Gynecology

VOL. 46

NOVEMBER, 1943

No. 5

In Memoriam

FREDERICK JOSEPH TAUSSIG

1872—1943

DR. TAUSSIG, a member of the Advisory Editorial Board of the JOURNAL since its founding, died of pneumonia August 21, 1943, at Bar Harbor, Maine, where he had gone a week before for a vacation following an operation in St. Louis on July 9 last. Though aged 70, convalescence was prompt and excellent, so much so that in five weeks he was able to depart on his vacation. Surviving are his wife, one married daughter, one son (Frederick Taussig, Jr., a Coast Guardsman stationed in Cleveland), two grandchildren, and a brother, the well-known internist Dr. Albert E. Taussig, of St. Louis.

Born in Brooklyn, N. Y., October 26, 1872, he came with his family to St. Louis at an early age. Graduated from Smith Academy, St. Louis, 1889, from Harvard University, B.A., 1893, and from Washington University, M.D., 1898. Interned for two years at St. Louis City Hospital for Women (formerly the "Female Hospital"), where he served as assistant superintendent, and then went to Vienna for further gynecologic study. Began private practice in St. Louis in 1902, and soon became associated with the Washington University School of Medicine, where he continued to teach. He advanced through the various instructor grades to Professor of Clinical Obstetrics and Gynecology, which position he attained in 1911 and graced with his splendid teaching ability and stimulating personality until his death.

An outstanding characteristic of Dr. Taussig was his tenacity of purpose in seeking the solution of difficult problems. This was manifested in his many useful activities, particularly in his attack on one of the most formidable problems in gynecology, namely, the effective treatment and prevention of vulvar cancer. Long ago when little hope could be given to patients with this disease, in which deep glandular involvement occurs so early, Dr. Taussig attacked the problem with

the true pioneering spirit of courageous enthusiasm and persistent industry. Through accurate recording of his cases and laborious pathological investigations and effective study of the same, he was able to establish definite information on which to base the plan of treatment which has saved so many of these patients and which is now standard for this disease. In prevention, likewise, his accurate methods and productive study established leucoplakic vulvitis as a large factor in the origin of vulvar cancer and excision of leucoplakic tissue as a decisive step in preventing the same.

Membership in scientific societies included American Gynecological Society (President, 1936), Central Association of Obstetricians and Gynecologists (President, 1932), American Medical Association (Section Chairman, 1911 and 1924), American Society for Control of Cancer, American Association for Cancer Research, American Radium Society, and the various local societies interested in gynecology and obstetrics. Hospital connections included Barnes, Jewish, Barnard Free Skin and Cancer, and St. Louis Maternity Hospitals. His consuming interest in cancer is shown by his leadership in the Missouri State Cancer Commission (of which he was Chairman and which founded the State Cancer Hospital at Columbia) and his productive work for the Barnard Free Skin and Cancer Hospital in St. Louis.

Dr. Taussig's extensive experience and study enabled him to do a great deal of informative and dependable writing. He is the author of two monographs, "Diseases of the Vulva" (1923) and "Abortion, Spontaneous and Induced, Medical and Social Aspects" (1935). He also made chapter contributions to Lewis' Surgery, Nelson's Loose-leaf Medical and Surgical volumes, Curtis' Obstetrics and Gynecology, Davis' Obstetrics and Gynecology, Brennermann's Pediatrics and Christopher's Surgery, in addition to numerous articles to medical journals through the years.

Dr. Taussig lived strenuously, usefully and happily his threescore years and ten, and his well-directed endeavors contributed materially to the advancement of effective practice in his chosen specialty.

H. S. Crossen.

Original Communications

A CONSIDERATION OF CERTAIN FACTORS PERTAINING TO THE CONTROL OF CARCINOMA OF THE CERVIX*

NORMAN F. MILLER, M.D., ANN ARBOR, MICH.

(From the Department of Obstetrics and Gynecology, University of Michigan
Hospital)

AMONG the many battles being waged today is the struggle against cancer. On this front alone, in these United States of America, over 150,000 lives are lost annually. Cancer destroys more lives than the combined toll from tuberculosis, diabetes, appendicitis, cirrhosis of the liver, alcoholism, and automobiles. Thousands of these deaths are the result of cervix cancer, a special field of serious concern to us as gynecologists.

My own interest in this problem dates back almost a quarter of a century, to the time when radical hysterectomy offered the only hope for cure, while for inoperable cases, actual cautery through a water-cooled speculum was the palliative procedure of choice. To the early 'twenties, when irradiation was fighting for, and achieving, a rightful place as an important remedial weapon. Through a decade of confusion, when the carcinoma patient was an unwanted derelict, to an era of mounting interest and stabilized therapeutic methods. In 1931, with the inauguration of our Gynecology Tumor Conference at Ann Arbor, it became possible for us to study cancer of the female generative tract in a more formal manner. Since the beginning of this conference, we have carefully evaluated and treated nearly 2,000 carcinomas of the female generative tract.

Of this number, 65.8 per cent, or 1,235, were cervix cancers. All of these patients have been carefully studied and evaluated by our Conference group, which includes members of the gynecology staff, representatives from the department of roentgenology, and when possible, the pathologist. All lesions have been carefully examined, and the neoplastic nature microscopically proved. Except for a few seen shortly after our group was first organized, all of these cases have been clinically grouped and the neoplasms histologically graded. All patients have been followed. There are no untraced cases in our entire series. In recent years this tremendous follow-up task has been the achievement of our social service department. Twice weekly for the past eleven years, the conference group has met to evaluate individual

*Presented at a meeting of the Chicago Gynecological Society, April 16, 1943.

NOTE: The Editors accept no responsibility for the views and statements of authors as published in their "Original Communications."

TABLE I. ANATOMIC DISTRIBUTION OF 1,876 MALIGNANCIES OF THE FEMALE GENITAL TRACT SEEN IN THE GYNECOLOGY TUMOR CONFERENCE FROM JULY 1, 1931, TO DECEMBER 31, 1942*

ANATOMIC SITE	NUMBER OF NEOPLASMS	PERCENTAGE OF ALL NEOPLASMS SEEN
Cervix	1235	65.8
Fundus	263	14.1
Carcinoma of Uterus (Site of Origin Unknown)	2	0.1
Ovary	158	8.1
Vagina	38	2.1
Vulva	83	4.4
Clitoris	8	0.4
Fallopian Tube	2	0.1
Bartholin Gland	1	0.05
Sarcoma of Uterus (Cervix or Body)	30	1.7
Carcinoma and Sarcoma of Uterus	4	0.25
Chorionepithelioma	10	0.5
Pelvic Malignancy Unclassified	39	2.2
Sarcoma of Vagina	3	0.2

*99 Consultation Only Neoplasms included in this Table.

patients and the problems pertaining to their classification, disposition, and treatment. Each year the results of this study have been recorded in statistical form, as the report of the Gynecology Tumor Conference. This living with the problem has been illuminating and instructive. It has crystallized thought, which now reappears as a dreary conviction that results are not what they should be, chiefly because of the long recognized fact that the disease is too far advanced when first seen. I shall have more to say about this obstacle to better survival rates, but first let us probe certain other pertinent factors.

On the Quality of Treatment.—The limitations of existing methods of treatment are well recognized. No one expects the impossible, but there is good reason to believe that therapy is disappointing. We appear to have reached that comfortable state wherein we hesitate to disturb the efficiency of a therapeutic system which has taken a long time to establish. Perhaps the ease of administration, as well as the apparent effectiveness of irradiation therapy, has lulled us into a state of inertia, in which we fail to exploit existing methods of treatment to their fullest capacity. In radical abdominal hysterectomy, as first performed by W. A. Freund in 1878, and later popularized by Wertheim, was recognized a potent weapon for combating cervix cancer. But, because of its high primary operative mortality rate, and its restricted field of usefulness, the operation was permitted to pass into the discard. Radium and x-ray have also proved their worth. Yet, after almost a quarter century devoted to the refinement of technic and stabilization of procedure, I find there is little to boast about. Inspection of Table II, showing a panorama of five-year survival rates since the turn of the century, reveals evidence of success, but in general the picture brews no optimism in my mind. Perhaps we have reached the end of an era. Perhaps if we could see into the future, we might visualize as the cancer therapist not the radiologist, not the gynecologist nor the surgeon, but possibly the chemist. It is not beyond the realm of possibility that

TABLE II. PANORAMA OF FIVE-YEAR SURVIVAL RATES

REPORTED BY:	YEAR	TYPE OF TREAT.	FIVE-YEAR SURVIVORS
Schuchardt ¹	1905	Surgery	*40.0%
Taussig ³	1912	Surgery	*41.6%
Neel ²	1912	Surgery	*35.0%
Cullen ⁴	1912	Surgery	*26.9%
Regaud ⁵	1923	Irradiation	45.0%
Healy ⁶	1924	Irradiation	20.0%
Heyman ⁸	1929	Irradiation	21.5%
Lynch ⁷	1931	Combination	*58.1%
Heyman ⁹	1931	Irradiation	*40.5%
Heyman ⁹	1931	Irradiation	23.1%
Healy ¹⁰	1931	Irradiation	22.0%
Crossen & Newell ¹¹	1932	Irradiation	22.3%
Delporte Cahen, & Sluys ¹²	1933	Irradiation	26.0%
Ward ²⁰	1933	Irradiation	21.6%
Bonney ¹³	1935	Irradiation	*55.0%
Schmitz ¹⁴	1935	Surgery	22.2%
Scheffey & Thudium ¹⁹	1936	Irradiation	25.3%
Bonney ¹⁵	1937	Irradiation	*39.0%
Shaw ¹⁶	1937	Surgery	*38.0%
Shaw ¹⁶	1937	Surgery	41.4%
Madame Curie Hosp., London ¹⁷	1937	Irradiation	36.2%
Plate, W. P. ¹⁸	1937	Irradiation	32.8%
Ward and Sackett ²¹	1938	Irradiation	28.5%
Kamperman ²²	1941	Irradiation	35.0%
Schmitz & Sheehan ²³	1941	Irradiation (High Voltage)	46.1%
Scheffey, Thudium, & Farell ²⁴	1942	Irradiation (High Voltage)	23.1%
Miller (present article)	1943	Irradiation	35.1%

*Based on operable cases, therefore not absolute survival rates.

radium may some day become a drug on the market, and deep x-ray therapy equipment an excellent source of copper wire and other spare parts. The limited capacity of existing remedial measures is definitely responsible for some of our restricted success, but any attempt to blame results on this basis alone might more properly be attributed to an indolence on our part—a failure to exploit to their fullest efficiency radium, x-ray, and surgery, or a combination thereof—a serious failure to give these methods of treatment a fair chance. In this last connection, the ineffectiveness of concerted and energetic efforts at lay education plays and important role. In both irradiation therapy and surgery, we have potent weapons. Perhaps neither has been developed to its fullest efficiency. Given an opportunity, these methods may still accomplish what we have a right to expect in the way of vastly improved survival rates.

Clinical Grouping.—While not directly related to the problem of survival, clinical grouping is so intricately woven into the pattern of our present problem that it cannot be entirely dodged, shrink as we may from the thought of reopening this moot question. Inspection of five-year survival rates listed in Table II reveals a marked disproportion which may be attributed to variations in technique. More likely, however, the better results noted by some observers are largely due to the character of the material with which they work. In most clinics there is a preponderance of advanced cases but in some the disproportion

tion between early and late is not so pronounced. That there is an important difference in the character of material treated and that it colors results has long been recognized. Such differences may continue to exist, but it would help a great deal in the evaluation of end results if we were all bound by one standard and universally acceptable clinical grouping. Existing classifications are numerous. No single clinical grouping has

TABLE III. GROSS ABSOLUTE SURVIVAL RATES FOR CARCINOMA OF THE CERVIX (1,164 NEOPLASMS), UNIVERSITY OF MICHIGAN

YEAR OF ADMITTANCE	SURVIVAL PERIOD	ALIVE DECEMBER, 1942	
		NUMBER	PER CENT
1931	11 years	23	26.1
1932	10 years	86	19.7
1933	9 years	88	19.2
1934	8 years	111	20.7
1935	7 years	104	22.2
1936	6 years	121	28.9
1937	5 years	91	35.1
1938	4 years	108	53.1
1939	3 years	111	47.7
1940	2 years	89	48.3
1941	1 year	109	73.4

yet been devised that is entirely satisfactory to everyone. It is with this realization that I venture to broach the subject at this time. To justify universal acceptance, a clinical grouping of cervix cancer should be:

- A. Simple
- B. Practical
- C. Easily understood
- D. Clearly defined
- E. Based on actual physical findings and not on assumptions
- F. One that places emphasis on early cervix cancers, and not on the advanced lesions for which existing remedial measures prove so disappointing.

The most notable attempt to provide a grouping of this sort is seen in the League of Nations classification. This classification has not been universally accepted, due, I believe, to four main objections, namely, (a) it is too complicated, (b) it is impractical, (c) it does not sufficiently emphasize the early lesion, and (d) it does not recognize the physical impossibility of definitely determining at a certain stage of the disease, the presence or absence of parametrial spread. The Schmitz classification, on the other hand, approaches the requirements set forth above. It is simple, and it does recognize the impossibility of sharp differentiation at certain stages in the course of the disease. It does not, however, place sufficient emphasis on the early lesion—that stage which is amenable to remedial methods already in our possession. The weakness then of the Schmitz classification lies in its too inclusive, illy defined first group. As an example of a clinical grouping which fulfills the requirements listed above, I present the following:

Carcinoma of Cervix

Clinical Grouping

	As Used at the University of Michigan Hospital
Clinical Group I	Very early carcinoma of the cervix. In general this group includes the early, suspicious, often unrecognizable clinically but histologically proved carcinomas of the cervix, i.e., intra-epithelial lesions and carcinoma arising in a cervical polyp, etc.
Clinical Group II	Any clinically recognizable histologically proved carcinoma still confined entirely to the cervix. No parametrial thickening.
Clinical Group III	Carcinoma of the cervix with questionable parametrial thickening. The cervical lesion may or may not be extensive, the characteristic feature of this group being the question concerning parametrial involvement. Into this group are placed those patients concerning whom there might well be a difference of opinion regarding the involvement of adjacent tissues.
Clinical Group IV	All advanced carcinomas of the cervix. Those with definite parametrial thickening, vaginal infiltration, frozen pelvis, etc. (May be subdivided for statistical purposes.)

TABLE IV. COMPARISON BETWEEN UNIVERSITY OF MICHIGAN AND OTHER CLINICAL CLASSIFICATIONS OF CARCINOMA OF THE CERVIX

UNIV. OF MICH.	LEAGUE OF NATIONS	SCHMITZ
I	I	I
II	I	I
III	-	II
IVa	II	III
IVb	III	IV
IVc	IV	IV

This clinical grouping was designed to meet specific requirements. It incorporates the desirable features of many classifications, and has proved its practicability and adaptability in our clinic.

I have no desire to dwell on this subject beyond repeating that a practical, simple, easily understandable, and universally acceptable clinical grouping for cervix carcinoma is essential. Without such, comparison of survival rates is destined to remain a matter of confusion.

On the Causes of Death.—Survival rates and cure rates are not synonymous. While we aim to cure, we must frequently be satisfied with prolonged survival. Many patients reported as free from evidence of the disease still have it, but they probably will not die from cancer, for patients with cervix cancer seldom die as direct result of the neoplasm itself. Instead death comes through the intervention of secondary causes. In an analysis of the deaths amongst our carcinoma patients soon to be reported by Dr. Russell deAlvarez, it was noted that in 66 per cent of the cervix cases death was the result of uremia, and/or impaired renal function caused by encroachment of the neoplasm or scar tissue upon the ureters. This work is more than a confirmation of what we have known for a long time, for it suggests an opportunity for palliation, for the prolongation of the patient's life by circumventing death due to renal dysfunction. Specifically, uretero-intestinal anastomosis looms as a possibility in these cases. To carry out this opera-

tion in these patients would necessitate a modification of both present-day indications and technique. If contemplated, the operation should not be delayed to the point of making it a sacrificial procedure. The likelihood of adding years of usefulness and of comfort to the patient's life appears well within the realm of possibility. Every experienced worker in the field of cervix cancer has had ample opportunity to observe the marked subjective improvement and the continued survival of once incapacitated patients following timely colostomy. Perhaps diversion of the urinary stream may similarly lead to a measurable addition to the life span of the afflicted individuals. When bowel obstruction is evident, uretero-intestinal anastomosis would probably be ill advised, although this is a matter for future evaluation. As a means of prolonging life, the possibility of uretero-intestinal anastomosis and ureterostomy may well deserve comprehensive study and trial.

On Lay Education and Early Treatment.—Lay education to the point of developing a symptom consciousness has long been considered our best approach to the problem of cancer control. In cervix cancer, this channel would permit early treatment and possible prevention of so-called precancerous lesions. The wisdom of lay education cannot be doubted. Next to a perfect cure—which we do not now possess—lay education offers the greatest opportunity for reducing the annual toll from this disease. All effort expended in this direction is for a worthy cause and it sounds well to say that such effort is never wasted. The facts reveal, however, that a tremendous amount of painstaking and conscientious work in this connection has been wasted. It may be recalled that in the heyday of the radical hysterectomy, the operability rates varied from 20 per cent (Taussig 1912) to 54 per cent (Cullen 1912). Since it is estimated that the chances for survival in cervix cancer decrease at the rate of 16 to 20 per cent per month after the appearance of untoward symptoms, these early operative rates probably indicate a time lapse of three to five months from the onset of the first symptom to the time of treatment. In 1933, I reported an average time waste of 6.2 months prior to the patients seeking medical advice. In 1941, R. M. Collins noted an average time waste of 7 months between the onset of the first symptom and the first examination. Oliver Todd, in 1941, reported a pretreatment time loss of 6.4 months. Perusal of patients admitted to our clinic during the past two years shows no improvement over the figures given above. When we consider the elaborate programs carried on by national, state and county organizations directed specifically toward the elimination of this time waste factor, the results of these efforts cannot be considered very encouraging. Further evidence in this connection is to be found in Table V showing no increase in early cases seen by us, but a definite increase in the number of advanced lesions.

While this discouraging picture is not pleasant to contemplate, the work of the many men and women who have fought this problem has not necessarily been in vain. Such cold evaluation of lay educational achievement may be brutal, but it is necessary if we are to inject new life into this extremely worthy cause. Scientific exhortation reaches few women and confuses most of them. Talking and preaching the gospel of periodic examination is sound enough but so far it continues to be only a worthy objective. The pictured hazards of neglecting untoward symptoms have been more fruitful in their accomplishment than the

spoken or printed word. As a step in this direction, I should like to present for your consideration a color film, designed for lay consumption. It is my intention to make this film available to any physician, to be used by him as he sees fit in the visual campaign against cervix cancer. Much of the failure in lay education can be attributed to misunderstanding and bewilderment. Many women are not sufficiently familiar with their own anatomy to know where the cervix is located, and most lay women are totally in the dark and completely confused by mention of such terms as erosion, cervicitis, and cystic change. Just what sort of a visual image of the cervix and the diseases to which it is heir our best

TABLE V. CARCINOMA OF THE CERVIX BY CLINICAL GROUP AND YEAR OF ADMITTANCE

CLINICAL GROUP	1931		1936		1942	
	NO.	%	NO.	%	NO.	%
1	1	4.2	7	5.5	7	5.7
2	3	12.5	14	11.0	10	8.2
3	7	29.2	32	25.0	18	14.8
4	13	54.0	74	58.0	86	71.1

educational efforts have produced in the minds of our patients is something for the psychiatrist to determine. If the cervix were clearly visible, the problem of maintaining its health would be non-existent. Once women see what the doctor sees—once they visualize changes likely to exist in the cervix, the obstacle to early and wholehearted co-operation will in large measure be overcome.

Discussion

DR. HAROLD O. JONES.—Dr. Miller's statistics, as well as those of other clinics, establish the fact that not a single variation in the technique of treatment of carcinoma of the cervix has been submitted during the last ten years which has in any way reduced the final death rate. We are all seeing patients with about the same degree of involvement of the parametrium as of ten years ago and submitting them to an almost routine treatment.

It is with envy that I read of Dr. Miller's 100 per cent "follow up," but we have been aware of the thoroughness of his organization for some time. This has made all of us realize the statistical and scientific soundness of reports emanating from this group. The clinical classification offered by Dr. Miller has all of the advantages claimed for it by the author, in particular simplicity and workability.

The study of any group of patients after treatment for carcinoma of the cervix, yields the highest percentage of cures in Group 1. This leads the author to conclude that the only steps which will in any way influence favorably the percentage of cures, will be such procedures as will place more of these patients in Group 1. The real theme of this paper then is the need of furthering the education of the laity to the end that much earlier in the course of this disease the patient will present herself.

DR. HERBERT E. SCHMITZ.—That the diagnosis and management of the patient suffering from cancer is best carried on by an organized tumor group, as described by our essayist, is an accepted fact. The cooperation of the gynecologist, pathologist and radiation therapist assures the sufferer a correct diagnosis and a well thought out plan of treatment. Such a group must have at its disposal all known means of diagnosing and treating cancer, whether by surgery, irradiation

therapy, or a combination of both. To employ a certain routine procedure or dosage in all cases is inadequate treatment. A basic plan may be acceptable, but variations in technique are necessary because of the extent of the tumor and the difference in response of certain cell types and individuals to irradiation. With the statement that therapy is disappointing, I cannot agree. Reports are appearing quite regularly describing changes in dosage, filters, applicators, and methods of application of both radon and radium element. X-ray therapy with the perfection of apparatus during the past ten years has gone to higher and higher voltages. Numerous investigators are combining surgical procedures with irradiation therapy to increase the efficacy of the latter. When we consider that it takes five years at least accurately to evaluate a plan of treatment, then we cannot expect revolutionary changes to appear at frequent intervals.

In June of 1940, before the American Radium Society, I made the following statement in a discussion of clinical Classification of Cancer of the Cervix, "The evaluation of end-results in clinical cancer survey studies would be greatly facilitated if the method of classification employed were universal and constant in order that the greatest possible comparability between statements from different clinics could be secured." The Health Committee of the League of Nations, realizing that no such uniformity existed, has attempted to introduce a uniform classification. Few collaborators from this country have adopted this arrangement of cases, preferring to invent a clinical classification of their own or confusing a previous system by modifying it.

In Group I of the Schmitz classification are included lesions up to 1 cm. in circumference, whether proliferating or ulcerating lesions. Our objection to the same group in the League of Nations' classification is that it is too extensive. If we are to teach early diagnosis, then our early group must be confined to those lesions which, in our clinic, are diagnosed mostly by biopsy. The survival rate in this group is higher than in other groups and will aid us in impressing the laymen with the fact that early cancer is curable. In Dr. Miller's classification there is no definite demarcation between Groups I and II, there being a great variation in accordance with the examiner's ability to diagnose cancer. In Group IV, which has always been the far advanced, hopeless, and palliative group, he includes many cases which would respond to therapy, thus increasing the survival rate in this group. Until we all accept one classification there will be great variations in our end-results and further confusion in evaluating the different methods of therapy.

Inasmuch as early diagnosis is the key to increasing our good end-results, I am in hearty accord with any and all lay educational programs. Whether the patient will be impressed with these educational films remains to be seen. Tumors of the breast are easily felt and their growth frequently detected by the patient, but the period of delay before seeking the advice of a physician is about the same as for cancer of the cervix.

DR. J. P. GREENHILL.—In spite of the prevalent conception that chronic inflammation, chronic irritation and lacerations of the cervix are responsible for carcinoma of the cervix, there is no proof for this assertion. While cancer of the cervix may arise on the basis of a chronic erosion, such an occurrence is unusual. A large proportion of women have chronic erosions for many years and never develop carcinoma of the cervix. The chronic inflammation which is found around cancer tissue is not the cause of the cancer but the result of it. Examination of the earliest cancers shows that the inflammation is found only in the immediate neighborhood of the cancer and not at a distance from it.

Schiller found prosoplastic changes or excessive differentiation of tissue in 57 out of 60 early cancers of the cervix. Schiller considers these changes, and not

chronic inflammation, as the forerunners of carcinoma. In the mouse, substances which produce chronic inflammation alone and not prosoplasia do not produce cancer of the skin.

It is well known that carcinoma of the cervix occurs particularly in women who have had a number of children and it has been shown that the pituitary gland of multiparous women contains a diffuse hyperplasia of the eosinophiles of the anterior lobe. Likewise, such changes have been found in the hypophysis of many women who have uterine cancer.

Experimentally, changes which resemble carcinoma have been produced in the cervical epithelium by the injection of anterior pituitary hormone and by the implantation of pieces of pituitary gland. It has been shown by Hofbauer that the cervical epithelium both in pregnancy and in the nonpregnant state is under the influence of the pituitary gland. In fact, all the epithelium and only the epithelium of the female genital tract reacts to such hormonal stimulation.

Zondek found that anterior pituitary hormone was excreted in the urine of about 80 per cent of women who had cancer of the genitalia, whereas this hormone was absent in most individuals who had extragenital malignant tumors. Likewise, this hormone was found by Zondek and others in men who had carcinoma of the testicles but not in men who had cancer of the prostate. Hence, cancer of both the male and female genitalia creates special hormonal conditions. Engle found a positive Aschheim-Zondek reaction in all animals which had received injections of urine from cancer patients but negative reactions in all animals which received urine from patients with sarcomas. He concluded that there is a causal relationship between hyperfunction of the hypophysis and carcinoma.

There must be a constitutional factor involved in carcinoma of the cervix, else how can we explain the relative infrequency of these cancers in certain groups such as Jewesses who are as prolific as other women and hence have as much cervical irritation? How about carcinoma in nulliparas?

Belief in a hormonal or constitutional cause for cancer of the uterus does not imply that there cannot exist prophylactic measures against the disease. In order for cancer to arise, there must be not only a constitutional factor which is associated with cell growth and metabolism but also in most cases some local factor which at present is not definitely known. Hence it is essential that the cervix be maintained in as normal a condition as possible. This means that during labor, trauma to the cervix should be avoided and that after labor, all lacerations should be properly repaired. Furthermore, all women, especially those who have had a number of children, should have periodic visual as well as tactile examinations of the cervix. Abnormal conditions in the cervix, particularly vascular and granular areas, should be treated by some form of electrotherapy or operation in order to avoid hyperplasia, metaplasia and prosoplasia of the cervical and vaginal epithelium which, under stimulation by the anterior pituitary gland, may lead to carcinoma.

DR. EDWARD ALLEN.—It seems to me that both the paper and the discussions have graphically brought out the fact that we can cure cancer if we get it early. While this excellent picture may bring the adult woman with cancer phobia to the examiner, I think we are starting at the wrong end. We have educated the little girl from the age of three to avoid any examinations of her genitals. Until we know more about the cause of cancer, whether it be heredity or irritation, education of woman to seek and demand examination of her genitals from childhood up, seems the only logical approach. The obstetrician should start early, should start now, to educate mothers in methods of educating their daughters as to the importance of routine pelvic examinations rather than to wait for the premarital examination when it is next to impossible to examine adequately due to the psychic reaction.

I do not believe we will ever educate or frighten women by a national program into going to the doctor for examination of the genitals, if we start as late as eighteen or twenty years of age. What few patients I see in a small private practice with genital cancer, have hesitated to come for pelvic examination long after symptoms have begun. I think there are more cases of delayed examination in genital cancer than cancer anywhere else in the body. This is not because the cancer is out of sight but because women hate any examination of the genitals. We as gynecologists have seen no need of pelvic examinations unless the youngster has grave symptoms. I firmly believe that until we educate women to accept routine pelvic examinations from childhood and demand it from there on, we will get nowhere in our diagnosis of cancer. Maternal training has also affected the male so that many times doctors hesitate to do vaginal examinations especially in young patients,

References

1. Schuchardt: Mentioned by Gellhorn, G.: *Trans. Am. Gynec. Soc.* 30: 141, 1905.
2. Neel, J. Craig: *Trans. Am. Gynec. Soc.* 37: 344, 1912.
3. Taussig, F. J.: *Trans. Am. Gynec. Soc.* 37: 322, 1912.
4. Cullen, J. S.: *Trans. Am. Gynec. Soc.* 37: 328, 1912.
5. Regaud, Cl.: *Curtis Obst. Gyn. Vol. III*, Curtis F. Burman.
6. Healy, Wm. P.: *Ann. Surg.* 93: 451, 1931.
7. Heyman, J.: *Acta. radiol.* 10: 49, 1929.
8. Lynch, F. W.: *AM. J. OBST. & GYNEC.* 22: 550, 1931.
9. Heyman, J.: Mentioned by R. T. Pettit, *Illinois M. J.* 60: 169, 1931.
10. Healy, W. P.: *J. A. M. A.* 97: 1680, 1931.
11. Crossen, H. S., and Newell, Q. U.: *AM. J. OBST. & GYNEC.* 29: 326, 1935.
12. Delporte, F., Cahen, J., and Sluys, F.: *J. A. M. A.*, June 24, 1933. Belgian Correspondence of May 13.
13. Bonney, V.: *AM. J. OBST. & GYNEC.* 30: 815, 1935.
14. Schmitz, H.: *Strahlentherapie* 54: 549, 1935.
15. Bonney, V.: Mentioned by Shaw, Surg., *Gynec. & Obst.* 64: 332, 1937.
16. Shaw, W. F.: *Surg., Gynec. & Obst.* 64: 332, 1937.
17. Madame Curie Hospital, London: Mentioned by Shaw, 1937.
18. Plate, W. P.: *J. Obst. & Gynaec. Brit. Emp.* 44: 737, 1937.
19. Scheffey, L. C., and Thudium, W. J.: *AM. J. OBST. & GYNEC.* 31: 946, 1936.
20. Ward, G. G.: *Surg., Gynec. & Obst.* 56: 434, 1933.
21. Ward, G. G., and Sackett, N. B.: *J. A. M. A.* 110: 323, 1938.
22. Kamperman, G.: *Surg., Gynec. & Obst.* 72: 384, 1941.
23. Schmitz, H. E., and Sheehan, J. F.: *Am. J. Roentgenol.* 45: 229, 1941.
24. Scheffey, L. C., Thudium, W. J., and Farrell, D. M.: *AM. J. OBST. & GYNEC.* 43: 941, 1942.

SOME DETERMINANTS OF MATERNAL AND PLASMA VITAMIN C LEVELS*

CURTIS J. LUND, M.S., M.D., AND MARIAN S. KIMBLE, Ph.D.,
MADISON, WIS.

*(From the Department of Obstetrics and Gynecology, and the Biochemical Laboratory,
Department of Medicine, University of Wisconsin Medical School,
and the State of Wisconsin General Hospital)*

A DETERMINANT, according to definition, is a circumstance or factor that, by itself or in combination with other circumstances or factors, fixes the nature of a result. In this study we shall consider the influence of pregnancy, labor, diet, season, hyperemesis gravidarum and other complications of pregnancy on the blood levels of vitamin C. In addition we shall examine the maternal-fetal relationship and some of its determinants. Since pregnancy increases the need for vitamin C, and since the exigencies of war have reduced the supply of natural as well as synthetic ascorbic acid, this aspect of nutrition in pregnancy is of timely importance.

According to available evidence the pregnant woman has a greatly increased need for vitamin C. Because of this, most investigators have reported that low maternal values are common during pregnancy.¹⁻⁸

Many believe that requirements for vitamin C increase progressively as pregnancy advances.^{5-8, 8-9} Under ordinary conditions there are two reasons for the increased needs of pregnancy: (1) Increased maternal metabolic activity, and (2) demands of the fetus and placenta. The fetus not only depends on the mother for vitamin C but also abstracts it at her expense. Consequently the fetal blood values are higher than maternal values^{2-8, 10-11} although some earlier workers, with less exact methods of analysis at their disposal, found little difference.¹³⁻¹⁴ The difference between maternal and fetal values is said to be greater when maternal values are low;⁴⁻⁵ or in other words, the fetal-maternal ratio is greater under such conditions even though absolute values are lower.

The daily requirements of vitamin C during pregnancy have not been accurately established.

Early estimates such as those of Widenbauer⁹ who recommended 28 mg. daily for the nonpregnant woman and 71 mg. daily during pregnancy, are obviously too low. The present tendency is to revise upwards the estimates of general adult requirements, which now are at approximately 75 mg. daily. Safe requirements for pregnancy have been placed at 100 mg. daily;¹⁵ however, if the pregnant woman's needs are double or treble those of the nonpregnant adult⁹ then the present standards for pregnancy appear to be too low. Javert and Stander⁸ estimated the requirements of pregnancy to be about 200 mg. daily, which is probably a more rational estimate. Teel et al.⁵ had great difficulty in maintaining a plasma concentration of vitamin C above

*Aided by a grant from the Wisconsin Alumni Research Foundation.

1.0 mg. per cent during pregnancy even though attempts were made to improve the diet. Only when the values were low at the onset of pregnancy could they be improved with a better diet.

Methods and Plan of Study

All determinations of maternal and fetal blood vitamin C in this study were made according to the macrophotocolorimetric technique described by Mindlin and Butler¹⁶ but without the use of KCN as "antioxidant." The results are expressed as milligrams per 100 c.c. of plasma—mg. per cent.

Certain necessary precautions were always observed in collecting and handling the samples of blood. All were fasting samples obtained in the morning excepting, of course, those taken at the time of delivery. All women who had ingested vitamin C within four hours of delivery were excluded from this study. Fetal samples were obtained from the placental end of the umbilical cord *immediately* after delivery of the infant. Speed is important. The blood must be obtained rapidly without stripping the cord and mixed quickly with the potassium oxalate; failure to observe these precautions resulted in clotted or hemolyzed specimens. Furthermore, blood which remained in the placenta or umbilical cord for more than a few minutes gave abnormally high readings for vitamin C. We cannot say whether these high values were due to diffusion of stored vitamin from the placenta into the blood or to some extraneous reducing substances. Whatever the cause, such results were not valid.

In order to gain information about seasonal variations of blood vitamin C it was necessary to pursue the study through a two-year period. Furthermore, the study was planned so that each patient would have a determination of vitamin C during each trimester and at the time of delivery. This program was successful in most instances, though some patients went elsewhere or were "lost" to observation for one or another reason. Others were incompletely studied because they did not seek prenatal care until later in pregnancy. One hundred and ninety-seven women were observed at some time during pregnancy and forty-six were observed on three or more occasions.

The mother's intake of vitamin C was estimated from a careful review of her dietary history and on this basis she was placed into one of three classes *at each visit*. Thus it was possible for the dietary classification to change from time to time according to recent and current intake of vitamin C. There were three classes as follows: *Adequate diet*, which fulfilled the requirements for vitamin C set forth in the pamphlet "Prenatal Care":¹⁷ In brief, each patient on such a diet received at least two servings of green leafy vegetables daily (one of which was raw), and one or more servings of fresh fruit daily. Citrus fruit or juices and tomato juice were used as substitutes for or in addition to the fresh fruit. When the intake of vitamin C was below this

standard the diet was classified as *fair* or *poor*. The "poor" diet included few or no fresh fruits or vegetables. For example, a woman who had fresh fruits and vegetables but once or twice weekly would be classified in the "poor" dietary group. Those with intermediate intakes were classed as "fair." The general level of vitamin C intake is more readily estimated from dietary history than is the intake of any of the other food essentials.

Results

Maternal Studies

Vitamin C was determined on more than 500 samples of blood obtained from 197 women at different stages of pregnancy. Most of the samples came from the group of 46 women who were studied three or more times throughout pregnancy. The remainder were observed but once or twice during pregnancy and many of these were a part of the experiment which determined the maternal-fetal relationship of vitamin C at the time of delivery.

Diet.—Individual as well as group values of ascorbic acid were closely correlated with the type of diet. Table I lists the mean plasma vitamin C of women grouped according to the type of diet. About half of our determinations were for women with an "adequate" diet and the plasma level (0.95 mg. %) averaged within the optimum range. Fifteen per cent of the diets were "poor" and the mean plasma value was very low (0.18 mg. %). An intermediate average (0.52 mg. %) was obtained for the group with a "fair" diet. The results illustrate the wide range of plasma values which may be seen during pregnancy and which depend, to a large extent, on the diet. These results also show that it is possible to maintain high plasma values by means of an adequate diet alone.

TABLE I. SHOWING RELATIONSHIP BETWEEN PLASMA VITAMIN C AND TYPE OF DIET*

DIET	NUMBER	MEAN VALUE MG. %	STANDARD DEVIATION	STANDARD ERROR
Poor	45	0.18	±0.092	±0.0014
Fair	103	0.52	±0.222	±0.022
Adequate	152	0.95	±0.252	±0.022

*For dietary standards see above.

While we made no attempt to study extensively the effects of supplements of ascorbic acid, we did observe 24 women at delivery who, in addition to an "adequate diet" had received 25 mg. of ascorbic acid daily, contained in the commonly prescribed mixed vitamin preparations. The mean plasma values for these patients was 0.94 mg. % (standard deviation ±0.196), while the value for 128 patients with adequate diet but *without* such supplements was 0.95 mg. % (standard deviation ±0.26). These mean values are obviously without significant difference.

Season.—We have shown that vitamin C levels vary as the diet. The diet in turn varies with the season. In this latitude there are only four months during which the supply of fresh home-grown fruits and vegetables is abundant and generally available. These months are

June through September. As the plasma vitamin C values tend to lag slightly behind increased consumption of the vitamin when the body is unsaturated, we have divided the year into three arbitrary periods: A—March through June, B—July through October (summer) and C—November through February. There was no seasonal variation in plasma values within groups of mothers with similar diets (Table II). On the other hand, the incidence of certain types of diet was influenced by the seasons. For example, during the summer months (period B) only 7 per cent of the diets were classed as "poor" but during the remainder of the year (periods A and C) the incidence of "poor" diets was 19 and 20 per cent respectively. The incidence of "adequate" diets was the reverse.

Pregnancy.—All agree that the need for vitamin C increases during pregnancy. Some investigators, as we have pointed out, believe that the need becomes progressively greater as pregnancy advances. A study of our data with this point in mind was not entirely satisfactory, chiefly because the major dietary and seasonal fluctuations of plasma vitamin C masked any minor effects which might be due to the progress of pregnancy. The following results from a small group of selected patients suggest that the demands do not increase greatly as pregnancy advances. We found that the dietary intake of vitamin C was fairly constant for each woman during the winter months whether at "poor" or "adequate" levels. Fig. 1 shows that the plasma values of these patients had no downward trend during pregnancy.

Additional evidence was obtained from an analysis of a single dietary class—those with "adequate" diets, during the winter months. Table III shows that the mean plasma value for this group remained about the same throughout pregnancy and delivery. Three patients with very low values probably account for the lower average value obtained during the third trimester. The average value at the time of delivery is again higher, and similar to the values for early pregnancy. From these results we doubt that there is a significant progressively increasing need for vitamin C during pregnancy.

TABLE III. SHOWING VARIATIONS IN PLASMA VITAMIN C IN WOMEN WITH "ADEQUATE" DIETS DURING THE WINTER MONTHS

STAGE OF PREGNANCY	NUMBER	MEAN VALUE MG. %	STANDARD DEVIATION	VALUE FOR "t"*	
First Trimester	8	1.04	±0.188	0.672	1.72 Not significant
Second Trimester	20	1.03	±0.263	Not significant	
Third Trimester	15	0.81	±0.252	2.240	
Delivery	38	0.97	±0.225	Significant @ 5% level	

*Statistical significance of the difference of the means determined according to Fischer's Table for "t".

Some investigators⁵ have had difficulty in maintaining adequate levels by diet alone. Study of Fig. 1 shows that it was possible to raise the low and intermediate plasma values to a high level and to maintain optimum values at a high level throughout pregnancy by diet alone. This was readily accomplished during the summer months. During the other months it was possible but more difficult.

We found, as did McDevitt et al.,¹⁸ no significant change in plasma vitamin C during labor. Five of eight women examined at the beginning of labor and at delivery showed no change in plasma values; in one an insignificant increase of 0.05 mg. per cent was recorded and in two, decreases of 0.07 and 0.11 mg. per cent respectively.

Sixteen women observed at delivery and again within 24 hours post partum showed a slight tendency toward lower plasma values. Half of these women showed a decrease ranging from 0.14 to 0.25 mg. per cent; the other half showed no significant change in values. These results differ from those obtained for vitamin A in the same patients.¹⁹ Plasma vitamin A *increases* greatly and consistently during the early puerperium.

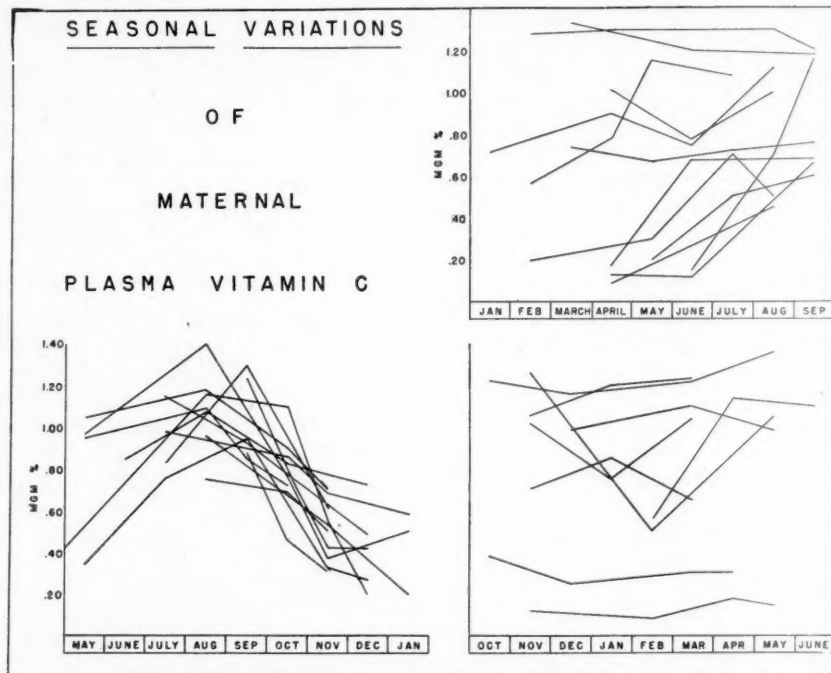


Fig. 1.—Showing seasonal variations in plasma vitamin C throughout each individual pregnancy and delivery. For purposes of greater legibility the group has been divided into three parts according to the season when delivery occurred: Upper right—those delivered during summer; Lower left—those delivered during fall and winter; Lower right—those delivered during spring.

When cesarean section was the method of delivery the early puerperal decrease of vitamin C was more consistent. Five women were observed before and after operation and in each the vitamin decreased from 0.12 to 0.46 mg. per cent.

Complications of Pregnancy.—As might be expected, we found no correlation between plasma levels of vitamin C and such conditions as toxemia of pregnancy, puerperal morbidity, duration of labor and complications of pregnancy in general (data not included). On the other hand, two complications were understandably related to vitamin C deficiency.

The first of these was *hyperemesis gravidarum*. It is unlikely that vitamin C deficiency has to do with the cause of hyperemesis gravidarum, but it can be a serious result. Table IV illustrates the individual plasma values for 11 women with hyperemesis gravidarum. The severity of the emesis, which depends on the duration and frequency of vomiting, is reflected in the plasma value. The woman with the zero value for vitamin C warrants further discussion, as she also had clinical signs of scurvy including the gingival lesions and petechial hemorrhages. These capillary hemorrhages were present not only in the skin but also in the retina. Stander²⁰ reported hemorrhagic retinitis in conjunction with pernicious vomiting of pregnancy in 1932 and advised the interruption of pregnancy when such hemorrhages appeared. We have observed the development and progress of retinal hemorrhages in two patients with severe hyperemesis gravidarum. Both women had clinical signs of scurvy. One had no vitamin C in the plasma; unfortunately the other was not studied by laboratory methods. In each instance fresh retinal hemorrhages continued to appear as long as vitamin C was withheld. Administration of vitamin K was without effect on the retina. However, the intravenous injection of 500 mg. of ascorbic acid daily stopped the development of new hemorrhages within 48 hours, and forthwith the retina returned to normal. In neither instance was therapeutic abortion necessary. It must be understood that the administration of vitamin C was but one of the many necessary therapeutic measures.

TABLE IV. PLASMA VITAMIN C VALUES IN HYPEREMESIS GRAVIDARUM

PATIENT	SEVERITY OF VOMITING	PLASMA VITAMIN C MG. %
Bl.	Mild	0.87
Bu.	Mild	0.63
Du.	Mild	0.59
Wa.	Mild	0.28
We.	Mild	0.38
Ga.	Moderate	0.09
Ka.	Moderate	0.22
Pr.	Moderate	0.17
Pru.	Moderate	0.28
He.	Severe	0.08
We.	Severe	0.00

A careful survey of our data failed to demonstrate any correlation between the plasma vitamin C values and the amount of post-partum bleeding, although on rare occasions a deficiency of vitamin C may be responsible for *post-partum hemorrhage*. Fifty-one women with less than 200 c.c. blood loss at the time of delivery had an average plasma vitamin C value of 0.70 mg. per cent while for 42 women with a blood loss between 200 and 400 c.c., the figure was 0.73 mg. per cent. Five women had post-partum hemorrhage—blood loss in excess of 400 c.c. Four of the five had "normal" value for plasma vitamin C but one had a zero value. A careful study of this patient revealed no other possible cause for the bleeding such as uterine inertia, retained secundines or laceration of the genital tract. For these reasons we believe the bleeding in this one instance was due to vitamin C deficiency.

Fetal-Maternal Relationships

The fetal plasma vitamin C values always exceeded those of the mother at the time of delivery. There were no exceptions under ordinary circumstances, and only a single exception was noted under experimental conditions to be described later in this paper. Ninety-four women and their babies were studied. The maternal values averaged 0.68 mg. per cent (standard deviation ± 0.39), and the infants' averaged 1.32 (standard deviation ± 0.48). On the basis of these figures it would appear that the fetal vitamin C level is about twice that of the mother, but average values in this instance are misleading. Further study of individual pairs showed that the maternal-fetal ratio of 1:2 was not always maintained (Fig. 2). This graph was made by plotting the value for each mother against that of her infant. Superimposed is a fitted curve which expresses the average change in maternal-fetal relationship which occurs at various levels of vitamin C concentration. For example, fetal values may be five to eight times greater than maternal values when the latter are low; when maternal values are high the fetal values may be but a half time higher. The shape of the curve (Fig. 2) suggests that at some high level both maternal and fetal values might be equal. To test this possibility we made the following observations.

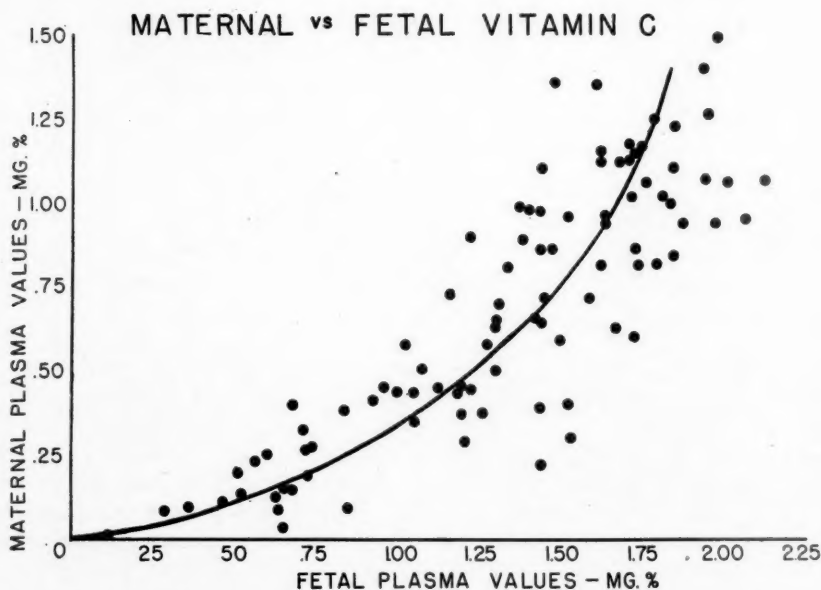


Fig. 2.—Individual maternal and fetal values at the time of delivery, with superimposed fitted curve.

We found intravenous injection of ascorbic acid to be the most satisfactory method of elevating maternal blood values during labor. Oral administration was unsatisfactory because of the derangements of digestion which usually accompany labor. Ascorbic acid in doses of 100,

250 and 500 mg. were given intravenously to women in labor. First the maternal values were determined. Then the vitamin was injected. Following this, periods of time ranging from 20 minutes to 15 hours elapsed before delivery. At the time of delivery both maternal and fetal values were determined. Table V details the results. It is evi-

TABLE V. SHOWING THE EFFECT OF INTRAVENOUSLY ADMINISTERED ASCORBIC ACID ON MATERNAL AND FETAL PLASMA VITAMIN C LEVELS—MG. PER CENT

PATIENT	DOSE MG.	TIME BETWEEN INJEC- TION AND DELIVERY (HOURS)	MOTHER'S LEVEL BEFORE INJECTION	MOTHER'S LEVEL AT DELIVERY	INFANT'S LEVEL AT DELIVERY	DIFFER- ENCE OF MATERNAL VALUES	DIFFER- ENCE BETWEEN MOTHER AND BABY AT TIME OF DELIVERY
Ad.	0*	½	0.61	0.57	1.32	-0.04	+0.65
Co.	100	¼	0.30	0.52	0.96	+0.22	+0.44
Hal.	100	¾	0.34	1.26	2.16	+0.42	+0.90
Har.	250	¼	0.65	1.83	1.62	+1.18	-0.21
Ke.	250	1½	1.42	2.04	2.14	+0.62	+0.10
La.	250	8	0.76	1.23	1.70	+0.47	+0.47
Lu.	500	½	1.04	2.49	2.44	+1.45	-0.05
Man.	500	1	0.72	2.11	2.26	+1.39	+0.15
Ma.	500	1¼	0.40	1.62	1.64	+1.22	+0.02
Pe.	500	2	1.10	1.90	2.29	+0.80	+0.39
Pl.	500	2½	0.73	1.65	2.06	+0.92	+0.41
Re.	500	5½	0.70	1.40	2.42	+0.70	+1.02
Su.	500	6	1.28	1.96	2.40	+0.68	+0.44
Wa.	500	12	0.98	1.18	2.46	+0.20	+1.28
Wi.	500	15	1.09	1.30	1.75	+0.21	+0.45

*Control injection of saline solution.

dent that both maternal and fetal values can be increased by intravenous vitamin C. Fetal values increased more slowly and did not reach an equilibrium with maternal values until approximately one to one and one-half hours after injection. When the time interval between the injection and delivery exceeded two hours the maternal values had begun to decline but the fetal level was maintained and values remained high for at least 12 hours.

Discussion

All of us who live in the northern latitude of the United States are well aware of the seasonal variations in foodstuffs rich in ascorbic acid. Many of these foods are difficult to obtain in the winter time, especially in the rural communities. Furthermore, when these foods are available, much potency may be lost by aging, processing, and exposure to air before serving. These several factors, we believe, were largely responsible for the seasonal changes noted in our results. The frequency of "poor" diets with their attendant low plasma vitamin C levels (mean value 0.18 mg. per cent) increased from 7 per cent during the summer months to 20 per cent during the other months. Nevertheless, and in spite of these seasonal factors, it was possible to maintain an optimal plasma vitamin C level during the winter months. It was

also possible to maintain a high level throughout pregnancy and delivery by means of diet alone. Thirteen of thirty-three women who received adequate diets had plasma values above 1.00 mg. per cent at the time of delivery. This is contrary to the findings of Teel et al.⁶ These investigators also reported declining values during pregnancy in spite of attempts to improve the diet. Our results were otherwise for we could maintain high values and elevate others by diet alone. The liberal ingestion of citrus fruits was an important factor in maintaining the high plasma values of our patients. Unquestionably the generous consumption of citrus fruits is a most satisfactory method of providing adequate amounts of vitamin C and they should be obtained every day during pregnancy. In this connection it should be pointed out that we observed little benefit from the administration of small supplements (25 mg.) of ascorbic acid. This additional amount of the vitamin did not alter plasma levels when given to women with good diets and it was far too little to supply the needs of women with inadequate diets. The use of such small supplements might give the physician a false sense of security as far as vitamin C metabolism is concerned.

There can be no doubt about the increased need for vitamin C during pregnancy, although we made no attempt to confirm experimentally this generally accepted statement. We could not show that the requirements for vitamin C increase progressively during pregnancy. If there is such an increasing need it cannot be great, and can easily be masked by the seasonal variations. For example (Fig. 1) if all our observations had begun in late winter and terminated in midsummer they would have suggested that plasma values *increased* with the progress of pregnancy. If, on the other hand, they had begun in summer and terminated in winter the opposite opinion would have been formed. During the winter the intake of vitamin C of our patients was fairly stable as were the plasma values and there was no tendency toward decreased values as pregnancy progressed.

Plasma vitamin C did not change significantly during the course of ordinary labor. While we did not observe the results following unusually long or difficult labors, it is not unlikely that vitamin C might be reduced under such conditions. There were no unusual changes during the early puerperium, although there was a slight tendency towards lowered values. This is in contrast to the behavior of plasma vitamin A, previously reported by us, which increases uniformly and significantly during the first 24 hours after delivery. Following cesarean section plasma vitamin C decreased consistently; a result not unexpected and readily explained by the nature of the procedure.

A deficiency of vitamin C may be one of several serious consequences of hyperemesis gravidarum. A reduction in plasma values was noted after mild vomiting and the decrease progressed with the severity and duration of the emesis. As far as we know vitamin C plays no part

in the cause of the disease, but the development of subclinical or clinical scurvy can be a disturbing and dangerous additional complication. Retinal hemorrhages, which are known to be a grave prognostic sign, are apparently a manifestation of generalized capillary fragility, and in that respect are similar to the petechiae of the skin. The appearance and development of retinal hemorrhages was not changed until ample amounts of ascorbic acid had been given (1,000 mg.). It is true that these hemorrhages are a grave prognostic sign, but they alone should not necessarily be used as an indication for therapeutic abortion. They are merely a sign of grave vitamin C deficiency. It is necessary to warn that administration of vitamin C is but one of many important therapeutic measures necessary for successful treatment of hyperemesis gravidarum.

We could show no relationship between plasma vitamin C and the ordinary amounts of blood loss after delivery. Many factors, some of them unknown, govern the amount of blood loss, and it would be exceedingly difficult to discover the influence of vitamin C should it exist. The situation as regards post-partum hemorrhage is similar. There are many etiologic factors. In one instance, however, we believe that a vitamin C deficiency (plasma value 0) was responsible for post-partum hemorrhage, as no other cause for the bleeding could be found.

Maternal-Fetal Relationship

When maternal requirements for vitamin C are not met during pregnancy the mother becomes depleted at the expense of the fetus. This is shown in Fig. 2. For example, only seven of 94 babies had plasma values below 0.60 mg. per cent while nearly half (41) of the mothers had values below that level. Never under ordinary fasting conditions did we observe a mother whose plasma vitamin C equalled that of her newborn infant. With one exception maternal values did not go above 1.40 mg. per cent but approximately 50 per cent of the fetal values were from 1.50 to 2.00 mg. per cent. Only 21 per cent of the infants' values were below 1.00 mg. per cent. Thus we see that about 80 per cent of the newborn infants usually have a normal complement of vitamin C. Nevertheless this does not permit the clinician to casually disregard the future state of the infant, for it has been shown that fetal values diminish rapidly after birth¹¹ and the sole natural source of vitamin C at this time is from the milk.

What is the mechanism by which fetal blood levels are kept higher than the mothers'? Synthesis of ascorbic acid by the fetus could explain the discrepancy. However, there is no convincing evidence that man, infants, placental or other animal tissue can synthesize ascorbic acid.²¹ Exclusive of synthesis the remaining source is the mother. Needham²² has said that most low molecular weight crystalline substances pass readily through the placenta and equal concentrations usually are reached in both bloods. Obviously such is not the ordinary

state of affairs for ascorbic acid. Though it passes readily from mother to fetus, as we have shown, an equilibrium is not maintained.

Manahan and Eastman,⁴ and McDevitt et al.¹⁸ suggest that a mechanism of selective filtration is responsible. This is a possible explanation for the passage of crystalline substances from a dilute into a more concentrated solution, though definite proof is still lacking.

From our studies of parenteral administration of ascorbic acid we have developed the following hypothesis: We know that ingestion or parenteral administration of natural or synthetic vitamin C results in a temporary elevation of the plasma values, which in most adults returns to fasting level within four hours. Our results showed that parenteral administration of vitamin C elevated maternal and fetal values to an equal level. Our studies further showed that the period of equilibrium between maternal and fetal values was short. There followed a rapid reduction of maternal values to normal while the fetal values remained high. This suggests to us that the placenta is a barrier to the re-entrance of ascorbic acid from the fetal into the maternal circulation. Maternal values continue to fall, presumably due to utilization, excretion and a small amount of storage. The fetus, however, has no method of excretion save through the placenta, and fetal values remain high because of *selective retention* of the placenta. Only after the fetus has utilized circulating vitamin C does the blood level drop, and at this time additional amounts may be obtained from the maternal circulation, in the manner just described. This mechanism of selective retention would account for the differences between maternal and fetal values throughout all ranges, as well as the dependence of the fetus on the mother for the vitamin.

Summary and Conclusions

Forty-six mothers had repeated determinations of plasma vitamin C during the course of pregnancy. One hundred and fifty-one mothers were observed once or twice during pregnancy, and 110 of these mothers and their infants were observed at the time of delivery. Over 500 photolorimetric determinations of plasma vitamin C were done. From these observations we have concluded that:

1. The plasma vitamin C level reflects the dietary intake of this substance. The mean plasma value for mothers with an adequate diet was 0.95 mg. per cent, with a fair diet, 0.52 mg. per cent and with a poor diet, 0.18 mg. per cent.
2. Season exerts a marked influence. During the summer months diets poor in vitamin C were uncommon (7%), while at the same time most (64%) of the mothers received an adequate diet. During the remainder of the year 20 per cent had poor diets and 43 per cent had adequate diets.
3. Optimal plasma values can be maintained by diet alone as long as it contains liberal amounts of foods rich in vitamin C. Fresh citrus

fruits, tomatoes and berries are excellent sources of ascorbic acid, and at least one of this group of fruits should be eaten each day during pregnancy.

4. Small doses of ascorbic acid, e.g., 25 mg. daily, are of little benefit alone, and they may lead the physician into a false sense of security unless he realizes that the daily requirements of the pregnant woman are *much* greater. If the woman receives an *adequate diet* there is no need for synthetic ascorbic acid. By adding it routinely to an adequate diet the physician may waste a valuable drug which is needed elsewhere during wartimes.

5. Blood levels of vitamin C did not change during labor. They tended to be slightly lower during the early puerperium and were definitely but not alarmingly lower after delivery by cesarean section.

6. Hyperemesis gravidarum may lead to dangerously low levels of vitamin C. Clinical scurvy may appear. The retinal hemorrhages of severe hyperemesis gravidarum are a manifestation of vitamin C deficiency and are similar to petechial hemorrhages seen elsewhere. These hemorrhages cease after adequate therapy with vitamin C, henceforth they are not necessarily an indication for the use of therapeutic abortion.

7. On rare occasions a deficiency of vitamin C may lead to post-partum hemorrhage, but the plasma values in general are not related to ordinary blood loss following delivery.

8. The fetus receives its supply of vitamin C at the expense of the mother and, under fasting conditions the fetal values are always higher than those of the mother, the difference being relatively greatest when maternal values are low.

9. Fetal blood vitamin C may be maintained at a level higher than the mother's by a process of selective retention by the placenta.

References

1. Gaethgens, G., and Werner, E.: *Klin. Wehnschr.* 16: 843, 1937.
2. Wahren, H., and Rundqvist, O.: *Klin. Wehnschr.* 16: 1498, 1937.
3. Braestrup, P. W.: *Acta Pediat.* 19: 320, 1937.
4. Manahan, C. P., and Eastman, N. J.: *Bull. Johns Hopkins Hosp.* 62: 472, 1938.
5. Teel, H. M., Burke, B. S., and Draper, R.: *Am. J. Dis. Child.* 56: 1004, 1938.
6. Snelling, C. E., and Jackson, S. H.: *J. Pediat.* 14: 447, 1939.
7. Möller-Christensen, E., and Thorup, C.: *Zentralbl. f. Gynäk.* 64: 1858, 1940.
8. Javert, C. T., and Stander, H. J.: *Surg., Gynec. & Obst.* 76: 115, 1943.
9. Widenbaur, F.: *Klin. Wehnschr.* 16: 600, 1937.
10. Nielsen, H. E.: *Bibliot. f. læger.* 130: 20, 1938.
11. Mindlin, R. L.: *J. Pediat.* 16: 275, 1940.
12. Neuweiler, W.: *Klin. Wehnschr.* 17: 1650, 1938.
13. Abt, A. F., Farmer, C. J., and Epstein, I. M.: *J. Pediat.* 8: 1, 1936.
14. Fleming, A. W., and Sanford, H. N.: *J. Pediat.* 13: 314, 1938.
15. National Research Council Committee on Food and Nutrition. Washington, 1941, Government Printing Office.
16. Mindlin, R., and Butler, A. J.: *J. Biol. Chem.* 122: 673, 1937.
17. United States Department of Labor Bureau Publication No. 4. Washington, 1938, Government Printing Office.
18. McDevitt, E., Dove, M. A., Dove, R. F., and Wright, I. S.: *Proc. Soc. Exper. Biol. and Med.* 51: 289, 1942.
19. Lund, C. J., and Kimble, M. S.: *AM. J. OBST. AND GYNEC.* 46: 207, 1943.
20. Stander, H. J.: *Surg., Gynec. and Obst.* 54: 129, 1932.
21. King, C. G.: *The Vitamins*, Chicago, 1939, American Medical Association.
22. Needham, J.: *Chemical Embryology*, 1931, Cambridge University Press.

LOW-DOSAGE IRRADIATION IN THE TREATMENT OF AMENORRHEA*

An Analysis of an Additional Ninety-Two Cases

CHARLES MAZER, M.D., AND ROSE GREENBERG, M.D., PHILADELPHIA, PA.

OUR three previous reports¹ included a total of two hundred and thirty-eight patients treated exclusively by means of low-dosage roentgen irradiation of the pituitary gland and ovaries for the relief of functional menstrual disorders. A long-term follow-up of one hundred and thirty-six of these patients was recently concluded by Reidenberg,² who found that 71 per cent of the amenorrheal and 78 per cent of the oligomenorrheal patients, treated between 1927 and 1937, are still menstruating at normal intervals. His long-term survey also disclosed that the eighty children born to some of these women are physically and mentally normal. Some of these children are now of high-school age. He found, moreover, that the three children of a woman who had received three courses of treatment at lengthy intervals are likewise physically and mentally normal. It is, therefore, reasonable to assume that low-dosage irradiation of the ovaries has no deleterious effect on the offspring of the first generation.

The erroneous concept that x-rays, regardless of the smallness of the dose, invariably cause structural and, consequently, functional deterioration of human cells is responsible for the reluctance of the profession to employ one of the most valuable agents in the treatment of amenorrhea. The published clinical results of many gynecologists and radiologists³ refute this belief.

That subminimal doses of roentgen rays, such as are employed in diagnostic procedures, do not injure even the sensitive ovarian cells of infants is clinically established. Such damage to the ovarian cells of infants was neither anticipated nor observed clinically even with the use of the old type of apparatus which required approximately five times the amount of irradiation, because of the absence of screens. That the cells of the mature ovary are more resistant to irradiation is well known. The problem is, therefore, purely a question of dosage in relation to the sensitiveness of the tissues exposed to the roentgen rays.

It seemed interesting to determine how many tissue roentgens are delivered at a depth of 7 cm. (the usual distance of the ovaries from the surface in a woman of normal weight) in a complete study of the urinary tract which often requires eight to twelve films.

*Read at a meeting of the Philadelphia Obstetrical Society, May 6, 1943.

J. L. Weatherwax, x-ray physicist, kindly volunteered the information. He states: "For 70 kv., 30 Ma. at 25 in. from the x-ray film and 17.5 in. from the skin of the patient, 4.2 roentgens were delivered to the skin of the patient; while approximately 0.6 tissue roentgens were delivered at a depth of 7 cm. for each film taken. These measurements were made in a water phantom with a nonshockproof x-ray tube and 1 mm. Al. filter at a distance of 50 cm. (20 in.) and gives approximately 15 per cent radiation reaching a depth of 7 cm. Your x-ray tube has approximately $\frac{1}{2}$ mm. Al. inherent and $\frac{1}{2}$ mm. Al. on the outside, which makes a total of 1 mm. Al. filter."

Twelve films would deliver 50.4 roentgens to skin or 7.2 tissue roentgens to the ovaries. The opponents of low-dosage irradiation concede that 7.2 tissue roentgens are harmless but fail to furnish proof that 32.5 tissue roentgens, delivered by the Edeiken technique, produce either structural or functional regressive changes in the human ovary.

In the light of clinical and experimental observations on low-dosage irradiation, the independence of functional from indiscernible structural changes in the cell must be conceived. We must envisage a dose of roentgen rays too small to produce even microscopic changes in the cell, yet capable of modifying its functional activity, possibly through indiscernible changes, such as rearrangement of electrons, etc.

For instance, in thirty-eight young women for whom panhysterectomies were planned because of early carcinoma of the cervix, Wagner and Schoenhof⁴ administered 5 to 10 per cent of a skin erythema dose of x-rays to one ovary of each patient several weeks before operation. In each instance, the histologic picture in the irradiated ovary revealed no evidence of degenerative changes as a result of the low-dosage irradiation. In fact, there were more follicles of equal maturity in the irradiated ovary than in the nonirradiated one.

Of the numerous statistical reports⁵ in the literature on the clinical effects of low-dosage irradiation of the pituitary gland and ovaries, not one is unfavorable. All of them indicate a degree of success not obtainable with any other single agent or combination of agents in the treatment of functional menstrual disorders and the frequently associated infertility. Nevertheless, many gynecologists and radiologists, who have never applied this treatment, solemnly warn the profession against its use—purely on the basis of their experience with large doses of roentgen rays for the relief of conditions unrelated to amenorrhea.

It is not the premise of this presentation to discuss the problem on the basis of theory or animal experimentation, but rather to record observations on the use of this measure in a group of ninety-two patients not included in our several previous reports.

Selection of the Clinical Material

Only those patients who were physically well, as shown by clinical and laboratory studies, were subjected to low-dosage irradiation of the pituitary gland and ovaries. Those suffering from hypo- or hyperthyroidism or from pituitary adenomas naturally were not given this

treatment. Girls under seventeen and women over thirty-nine years of age were excluded, because their ovaries are either immature and, therefore, too sensitive to irradiation or in the phase of natural decline. Thirteen of the patients were between seventeen and twenty years of age; seventy-one ranged in age between twenty-one and thirty; and only eight were between thirty and thirty-six. The possible presence of pregnancy was eliminated by a biologic test, unless the patient happened to have recently menstruated.

Cured patients who had received simultaneously with the x-ray treatment some form of organotherapy are deliberately excluded from this study on the assumption that the latter may have contributed to the good results. On the other hand, patients who failed to respond to combined roentgen-ray and endocrine therapy are included in the failures because of our conviction that the endocrine products were not responsible for the lack of response to irradiation. Those who failed to respond within two months after irradiation or conceived soon after treatment without subsequent restoration of the menstrual rhythm, are also excluded from the list of cures in the belief that the pregnancies were incidental and, therefore, not attributable to the irradiation. All patients were followed up for a period of one or more years. Instances of improvement or restoration of the menstrual function for a period of less than a year are grouped as failures. Adherence to these rigid requirements, set up as a guard against erroneous deductions, justifies the presentation of this report.

Technique of Low-Dosage Irradiation

The ninety-two patients were treated by several radiologists who employed for years the technique of Edeiken⁵ with uniformly good results. The technique may be described as follows: 135 kv., 5 Ma. at a distance of 35 cm., with $\frac{1}{4}$ mm. cu. and 1 mm. of aluminum filtration through an anterior pelvic field. Depending on the size of the pelvis and the thickness of the abdominal wall, a dose of 50 to 90 r. measured in air is given. This is repeated three times at intervals of one week. The pituitary gland is treated with the same dosage at the same time through a field of 5 by 5 cm. just above and posterior to the midpoint of a line joining the outer canthus of the eye and the external auditory meatus. Close adherence to this technique or to the one employed by Kaplan⁶ avoids ill effects. Variation in dosage and method of application is, to say the least, confusing in so far as determination of results are concerned.

Results of Treatment

Ten of the ninety-two patients had not menstruated for periods varying from sixteen months to six years, with an average of two years and eight months for the group. Five of them (50 per cent), including the one with total amenorrhea for six years, have been menstruating regularly during a follow-up period varying from one to five years, with an average of three years for the group. Twelve of the ninety-two patients had menstruated at intervals of six months. Eight of these twelve (66 per cent) have been menstruating normally during a follow-up period averaging two and a half years. Sixty-eight of the ninety-two patients had a milder type of amenorrhea, known as oligomenorrhea, having menstruated before treatment at intervals of from two to four months. Fifty-two of these sixty-eight (76.5 per cent) have been

menstruating normally during a follow-up period ranging from one to five years, with an average of two years and seven months for the entire group.

One of the patients, aged eighteen years, who had never menstruated, despite intensive organotherapy, responded promptly to low-dosage irradiation. Previous experience has shown, however, that primary amenorrhea does not, as a rule, respond to this type of treatment, probably because of an inherent Müllerian defect. It was employed in this case as a last resort. Another patient, aged twenty-two years, was supposedly adversely affected by the treatment. She had been completely amenorrheic for eight months despite the daily administration of 3 grains of desiccated thyroid substance to maintain a normal basal metabolic rate. Her thyroid gland was not enlarged and she lacked the usual symptoms and signs of hypothyroidism. Low-dosage irradiation was tried in June, 1942, without relief. She has remained totally amenorrheic since then. It is obvious that the treatment was ill chosen, for she apparently has a thyroid malfunction secondary to a rare type of pituitary deficiency wherein thyroid substances as well as low-dosage irradiation are ineffective.

A second course of treatment was administered to ten of the ninety-two patients, who had shown improvement in menstrual rhythm following the first course. Only three of ten were thereby restored to normal menstrual periodicity. The remaining seven patients were, however, not adversely affected by it. One patient, previously mentioned, who had received three courses of treatment at lengthy intervals, has delivered three healthy children and is still menstruating normally.

This study bears out our previous observations that the percentage of cures is inversely proportional to the severity of the amenorrhea. Thus, those who had menstruated at intervals of two to four months yielded the highest number of cures (76.5 per cent); those who had menstruated at intervals of six months yielded 66 per cent cures; whereas those who had not menstruated at all for sixteen months to five years prior to treatment yielded only 50 per cent cures.

Influence of Low-Dosage Irradiation on Associated Conditions

Of the ninety-two amenorrheic women, seventeen had also experienced episodes of prolonged uterine bleeding following variable periods of amenorrhea. Control of the bleeding was the more important consideration. It was accomplished in twelve of the seventeen by means of injections of chorionic gonadotropin in doses of 500 international units daily as long as the bleeding persisted. This hormone is known to have no stimulating effect on the human ovary. It does, however, through some unknown means, arrest dysfunctional uterine bleeding in most women of childbearing age, but does not restore the menstrual rhythm. All of the seventeen patients were subsequently subjected to low-dosage irradiation but in only six of the seventeen was the menstrual rhythm restored.

Sterility was an associated and important factor in fifty-four of the ninety-two patients. They were involuntarily barren for two to fourteen years, with an average of three years for the entire group. In most of them, other than endocrine factors, such as nonpatency of the Fallopian tubes, coexisted and were simultaneously treated. Thirty of the fifty-four infertile women conceived at variable intervals after termination of treatment. Twenty-eight of them delivered healthy in-

fants; the remaining two aborted during the first trimester of pregnancy. Twenty-one of these thirty patients conceived within four months after termination of low-dosage irradiation—a few without an intervening menstrual flow. Complete restoration of the menstrual cycle for over a year in nineteen of the twenty-one women who conceived soon after treatment implies that conception was the result of improved ovarian activity. Two of the 28 successful pregnancies followed a second course of low-dosage irradiation, given because the first attempt failed to restore completely the menstrual function.

Summary

A follow-up for nearly three years of ninety-two additional cases of amenorrhea, treated by means of low-dosage irradiation of the pituitary gland and ovaries, shows that sixty-five (seventy-two per cent) of the patients have been menstruating normally. It is noted that the data gathered from a long-term follow-up of one hundred and sixty-five cases, similarly treated and previously reported, show permanency of the cures and the safety of the procedure to both the patient and her offspring.

Of the ninety-two amenorrheic patients in the present group, fifty-four desired offspring but had not conceived despite the intensive use of organotherapy and other measures for several years. Twenty-eight (fifty-four per cent) of the fifty-four barren women conceived and carried to term healthy infants; two aborted during the first trimester of pregnancy. All of the thirty women have been menstruating normally since the termination of pregnancy.

Low-dosage irradiation of the pituitary gland and ovaries for the relief of amenorrhea should not be administered without a preliminary pelvic examination and a dependable biologic pregnancy test, unless the patient happened to have menstruated a couple of weeks previously.

A survey of the literature on low-dosage irradiation of the pituitary gland and ovaries, as employed for the relief of amenorrhea, reveals no adverse effects either on the patients or their offspring. Instances of harm recorded in the literature were the result of heavy irradiation, employed in the treatment of uterine fibroids and kindred conditions.

The importance of employing a uniform technique and dosage is emphasized, for the boundary line between the clinically effective and the injurious dose of roentgen rays has not been determined.

References

1. Mazer, C., and Goldstein, L.: *Clinical Endocrinology of the Female*, Philadelphia, 1932, W. B. Saunders Company.
Mazer, C., and Spitz, L., Jr.: *AM. J. OBST. AND GYNEC.* 30: 214, 1935.
Mazer, C., and Baer, G.: *AM. J. OBST. AND GYNEC.* 37: 1015, 1939.
2. Reidenberg, L.: *AM. J. OBST. AND GYNEC.* 45: 971, 1943.
3. Mazer, C., and Israel, L. S.: *Diagnosis and Treatment of Menstrual Disorders and Sterility*, New York, 1941, Paul B. Hoeber, Inc., p. 157.
4. Wagner, G. A., and Schoenhof, C.: *Strahlentherapie* 22: 125, 1926.
5. Edeiken, L.: *AM. J. OBST. AND GYNEC.* 25: 511, 1933.
6. Kaplan, I. I.: *New York State J. Med.* 38: 226, 1938.

Discussion

DR. JACOB HOFFMAN.—I should like to emphasize that it is still debatable whether small doses of the x-rays are capable of stimulating endocrine function. Even if this were granted, there is nothing to suggest that, when applied to the pituitary gland, the rays will affect only its gonadotropic activity and leave unaltered all the other important functions now ascribed to this gland. Fortunately, this structure would appear to be fairly resistant to the action of the x-rays and the danger of damage is not serious. This is apparently not true of the ovary. While ovarian function may remain undisturbed after irradiation in some women, in others permanent damage may result from the application of comparatively small doses. I have encountered women who became permanently amenorrheic and sterile following such treatment. It must be borne in mind that, in the treatment of "dysfunctional menstrual disorders," we are dealing with subnormally functioning ovaries which may be further depressed by a dose of x-ray which might leave the normal ovary unharmed.

Though a return to normal menstrual rhythmicity and fertility may not infrequently be observed after low-dosage irradiation, we are not justified in crediting the rays with these results, for other measures which may have a curative effect are usually also employed in such cases. In the sterile woman, for example, curettage and tubal insufflation are performed for diagnostic purposes. Curettage alone is known to be followed by conception in from 20 to 25 per cent of the cases, while from 15 to 18 per cent may benefit from tubal insufflation. In the treatment of menstrual disorders, spontaneous correction of the underlying deficiency may account for a goodly number of the cures ascribed to irradiation. It is noteworthy that most of the cases showing a favorable response are younger women, whose condition is often self-limited.

DR. ARTHUR FIRST.—Dr. Mazer has given us convincing proof to justify his extreme optimism in regard to the use of low dosage irradiation of the pituitary gland and ovaries in the treatment of amenorrhea. This is the fourth report that he has submitted, making a total of 330 patients treated and followed up in almost two decades. This is certainly a large enough group of cases to give weight to Dr. Mazer's conclusions of the harmlessness of the method and the high percentage of cures.

My role in discussing this paper is simply to substantiate Dr. Mazer's claims from my own experience in private work with in addition the use of this method for the past fifteen years in the Sterility Clinic of Jefferson. Although we have a smaller series of patients, our results have been equally as good.

There are, however, still a number of "die-hards" who refuse to countenance this form of treatment and who still cry out against it. In the 1942 Year Book of Obstetrics and Gynecology, Greenhill makes an editorial comment, "I should like to repeat my annual warning that until we know much more about the late effects of irradiation treatment, we should be extremely careful about employing it in young women either for amenorrhea or for sterility." Traut of New York City at a recent meeting of the Texas Association of Obstetricians and Gynecologists stated, "such experiments, for such they are, are inadequately controlled so that one cannot state with any degree of assurance that the radiation therapy was of substantial benefit. Experimental work which has been done on mice and guinea pigs demonstrates beyond a doubt that in these animals the effect of radiation may be transmitted and appear two, three, or even four generations later in the form of abnormal developments of the extremities resulting in partial or complete absence of arms or legs or with clubbed feet."

For many years I have made a study of the large number of sterility patients who abort within a few months after getting pregnant and of the not too infrequent patient who after a great deal of endocrine therapy goes to term but

delivers an abnormal fetus, evidence of so-called low reproductive efficiency or poor germ plasm. Would it not be most illogical to refuse to treat sterility patients because of these remote possibilities? The large number of sterile women who are ultimately delivered of healthy children warrants trying all the means at our command to cure them. By the same analogy one is not justified in fearing to try low-dosage irradiation since a higher percentage of blighted ova is to be expected in these women regardless of the type of therapy employed.

I would like to cite an interesting case of a private patient, Mrs. F. M., who had been sterile for thirteen years, with variable periods of amenorrhea of from three to five months. In May, 1942, she received a complete x-ray study of her gall bladder, gastrointestinal tract, and spine. Following this study she had two normal periods spaced one month apart for the first time in years and then promptly became pregnant and delivered a healthy baby at term. The roentgenologist informs me that this patient inadvertently received almost as much stimulation to her ovaries as she would have received in low-dosage irradiation. It is interesting to conjecture whether this x-ray investigation cured her amenorrhea and accounted for the cure of her long-standing sterility.

Dr. Mazer is to be congratulated for the intensive follow-up study of his patients to prove that at present low-dosage irradiation yields better results than any form of organotherapy in the treatment of amenorrhea. Whether endocrine therapy will eventually give as good results as low-dosage x-ray remains to be seen.

DR. S. LEON ISRAEL.—We have all had the experience of having a patient who had been referred for x-ray treatment return to us with what appeared to be an adverse effect. If one inquires closely, he usually finds that the radiologist has administered a dose larger than the one recommended. In Dr. Mazer's earlier papers, as well as in the one by the essayists tonight, the importance of not varying the dosage is well stressed. Dr. Ira I. Kaplan of New York has a similar series of patients with equally favorable results. He also stresses the point of never exceeding the maximum dose recommended for this form of therapy.

The problem of tissue harm following such low-dosage irradiation is a purely imaginary one. With such dosage, no one has ever demonstrated destruction of ovarian tissue. It is, however, very easy to prove that no harm occurs. About three years ago, Dr. Philip J. Hodes and I experimented with 125 isolated rabbits. The animals were treated with x-rays to the pituitary and ovarian regions, employing a dose similar to that employed in the human being for low-dosage purposes. In several animals, the same dose was administered. We could not detect any histologic change in the ovaries of the treated animals. Moreover, in each instance, the animal's ovaries, following irradiation, responded to pregnancy urine injections or to mating with the usual ovulation points. At least in the rabbit, such irradiation does no obvious harm.

DR. CHARLES MAZER.—Concerning Dr. Hoffman's remarks, be it remembered that it was not the premise of this presentation to discuss the problem on the basis of theory or animal experimentation. This paper is confined to clinical observations. Moreover, if Dr. Hoffman's clinical experience with low-dosage irradiation of the pituitary gland and ovaries during the past fifteen years has been as bad as he states, why has he not reported this fact? Thus far, not one of the numerous reports in the literature has been unfavorable.

**THE USE OF THE HYPNOIDAL STATE AS AN AMNESIC,
ANALGESIC AND ANESTHETIC AGENT
IN OBSTETRICS**

WILLIAM S. KROGER, M.D., AND SOL. T. DELEE, M.D., CHICAGO, ILL.

THE late Dr. J. B. DeLee,¹ whose encouragement stimulated our research in this field has stated that, "the only anesthetic that is without danger is hypnotism. Psychiatrists claim no person ever died under pure hypnosis. This mental narcotic was introduced into surgery by Recamier in 1821 and obstetricians have dallied a little with it. Von Oettingen in 1921, discouraged by the bad experience of twilight sleep tried it systematically, others tried posthypnotic suggestion which means putting the gravida in a trance and suggesting a painless labor at term. While I have not used pure hypnotism very often, I have used suggestion a great deal, indeed almost constantly and I am irked when I see how my colleagues neglect to avail themselves of this harmless and potent remedy."

The relief of pain in childbirth has been one of the long sought goals of the medical profession. We believe the only method that has complete safety for mother and baby, without altering the normal mechanism of labor, is hypnosis. We maintain that hypnosis has unrealized possibilities for making childbirth not simply the equivalent of a surgical operation, but rather a satisfying psychological experience which may fulfill deeply felt and sometimes unrecognized and unformulated needs of the mother. This rational method of analgesia and anesthesia receives a brief but favorable paragraph in the textbook on obstetrics by DeLee and Greenhill,² who state that, "hypnosis has been used for a long time in obstetrics and should be employed more often than it is at present. Even if complete hypnosis is not to be resorted to, physicians should remember that repeated suggestions with or without the aid of medication can accomplish a great deal in labor, particularly for the relief of fear as well as the pains of labor."

From Germany and Russia, numerous cases of painless childbirth are reported as having taken place by the use of preconfinement and labor suggestions given under hypnosis, either in its pure form or super induced by small amounts of opiates: Kirstein,³ Heberer,⁴ Von Oettingen,⁵ Hartmann,⁶ Franke,⁷ Schultze-Rhonhof,⁸ Kogerer,⁹ Falk,¹⁰ Friedlander.¹¹

From published reports it seems that this was a popular method of delivery at the Heidelberg clinic.³ Wolff¹⁴ has confirmed the practical usefulness of this method and through the medium of narcotics and hypnosis succeeded in inducing analgesia and anesthesia in suitable patients.

We have modified these methods by the induction of amnesia, analgesia and anesthesia early in labor, thus eliminating all pain and discomfort continuously for the parturient until the completion of labor and perineal repair. In most of our cases pure hypnosis was used.

Since 1931, one of us (W. S. K.) has successfully managed the entire course of eleven out of twelve confinements with this method. There was only one failure in this small series of cases. Ten of our patients were primiparas and one was a multipara, the latter was delivered twice under hypnosis. Prophylactic forceps, episiotomy, and perineorrhaphy were performed in all of our cases.

The technique of hypnotism has been ably described by Erickson,¹⁵ Bramwell,¹⁶ Schilder and Kauders,¹⁷ and others.

The various stages of hypnosis have been thoroughly described by Young,¹⁸ Erickson,¹⁹ and many others. The former has reviewed the world literature up to 1931.

Management of the Prenatal Period

The patient is placed in a deep hypnotic state before the seventh month of gestation. Posthypnotic suggestions are given to the effect that her labor will be entirely painless, that she will have no recollection of the entire procedure, and that she will look forward to her confinement with a feeling of joy and happiness instead of dread and anticipation. Posthypnotic suggestions last about a month, and when repeated often enough the effect will become permanent.^{20, 21} The nature and character of these posthypnotic suggestions have been described by Erickson²² as separate hypnotic states arising spontaneously in the individual. The gravida is then conditioned to the voice of the operator. Suggestions are given that she will fall into a deep hypnotic sleep at a given command. In addition, she is told she will follow all suggestions given her during this period.

The patient returns every two weeks and the same suggestions are repeated to her in the hypnotic trance, which is a state of increased hypersuggestibility. The percentage of individuals that can be hypnotized, and the depth of hypnosis varies with the experience and ability of the operator. In our experience, comprising several thousand cases of hypnosis, the incidence of success has been about 90 per cent. Forel, Wetterstrand and others report similar results. In addition, the various combinations of suggestive therapy were utilized successfully in several of our patients to create an aversion to food, tobacco and alcohol. A conditioned reflex technique described by one of us (W. S. K.)²³ was used. Also, the multiplicity of various complaints, i.e., aches, pains, heartburn and constipation were relieved with remarkable ease.

It is imperative that the gravida maintain complete confidence and rapport with the operator. Suggestions must be dignified at all times

and in keeping with the gravida's desires. After the proper training or conditioning the gravida can be put into an amnesic, analgesic and anesthetic state in five or ten seconds.

Management During Labor and Delivery

Hypnotic sleep is induced when the gravida is in active labor, or when the cervix is dilated between two to four centimeters. The patient is told that her sleep will be deep and continuous. Also, she will hear only the commands of the operator or the person placed en rapport with her.

Our experience has been that these patients, after careful preparation, will be most cooperative during labor. They can converse with the operator, and ask for food, urinate or defecate at their own request. They lie motionless and require no particular attention except routine care. The normal mechanism of labor is not interfered with and during the latter part of the second stage the gravida can be told to bear down with each contraction, thereby facilitating the completion of the expulsive stage.

The respiration is diaphragmatic in type, the pupils are usually fixed and dilated. The limbs can be made cataleptic or flaccid during delivery and complete relaxation of the entire body can be produced simply by command. Any type of operative delivery is facilitated. Speed is not essential since the gravida will sleep until told to awaken. Posthypnotic suggestions are then given that she will be sound in mind and body and will have no after effect such as headache or pain. All patients wake up promptly when told to do so.

Advantages and Indications of the Use of Hypnosis in Labor

1. The procedure is relatively simple and no great amount of skill is necessary. Any physician can be taught the method.
2. No apparatus or expense is involved. It is the ideal method for home or hospital delivery.
3. There is absolutely no respiratory or circulatory depression in mother or fetus with resulting anoxia, asphyxia and cerebral damage.
4. Hypnosis raises the resistance to obstetric shock, circulatory and respiratory failure. Morphine, the barbiturates and paraldehyde act in the opposite way.
5. Resistance to fatigue and muscular effort during hypnosis is raised by more than 16 per cent, as shown by Williams.^{24, 25} Hence, there is little or no maternal exhaustion, which, undoubtedly is a contributing factor in the production of sepsis and shock.
6. The method is indicated when dealing with patients with a toxemia of pregnancy or cardiac decompensation or when a premature baby is concerned.

7. Complete hypotaxia or disassociation instead of hyperexcitability results from hypnosis. Patients are calm, quiet and relaxed. They usually make no noise even during the height of labor and delivery.
8. There is no depressant action on uterine contraction and retractions, as seen with most general anesthetics.
9. No untoward reactions such as delirium or jactitation.
10. Analgesia and anesthesia are easily controlled. The patient can be told to awaken at any time. Most anesthetic agents such as intravenous evipal and barbiturates are beyond control once they are introduced into the body.
11. Postoperative recovery is smooth, and there is no danger of pneumonia, massive collapse of the lung, vomiting or coughing.
12. Blood loss is decreased during the hypnotic state probably due to a vasospastic condition of the capillaries or an effect on the blood coagulation time.
13. No injections are needed as with continuous caudal, spinal or local anesthesia. The latter are not without danger and require special skill.
14. The subjective pain element is not lost. Some contend that the pain of childbirth is a necessary psychological experience. The gravida can be awakened at any time and the progress of labor followed.
15. The method is a time saving procedure. The attention of the physician is not required if trained persons are available. Rapport can be transferred to an interne or nurse.
16. The amnesia, analgesia or anesthesia can be produced over the telephone, in suitably conditioned patients.
17. There is no increase in the incidence of operative delivery.
18. Complete relaxation or contraction of the abdominal wall and perineum can be produced simply by the command of the operator.
19. There is not the remotest possibility of danger to mother or baby.

The following case report is typical of our methods and results. Mrs. K. C., aged 20, last period May 2, 1942, at term February 9, 1943. Para 0, gravida i. She was first seen when 6½ months pregnant and was found to be normal, generally and obstetrically. The patient being quite intelligent was approached regarding the use of hypnosis. She was first hypnotized on November 2, 1942. Posthypnotic suggestions were given that the labor would be entirely painless, she would have no dread or anticipation for her confinement and would have a complete loss of memory for the entire experience. She was hypnotized bimonthly, 6 times before the onset of labor. Her prenatal period was uneventful, except for a rapid gain in weight, due to an uncontrollable appetite. Posthypnotic suggestions were utilized successfully to produce a loss of appetite, which resulted in a more normal weight gain. She wished to stop smoking; a few posthypnotic suggestions to the effect that she would vomit every time she tried to smoke, quickly produced the desired results.

Labor began at 4:30 A.M. on February 8, 1943. She entered the Chicago Lying-in Hospital 9:30 A.M. At this time she had 2 cm. dilatation,

the pains were ten minutes apart, of moderate intensity and regular. She was placed in a deep hypnotic state at 10:00 A.M. en rapport with Dr. Kroger. Labor progressed normally, during which time she asked to be fed and she urinated several times. She was deaf to the voice of her husband as well as the personnel on duty. She showed no sign of distress at any time. Rectal examinations produced no discomfort. The patient was completely disassociated as to time and place and talked only to Dr. Kroger. She complained of a slight backache. At 4:30 P.M. she vomited and awakened. At this time the cervix was dilated 9 centimeters. The pains were stronger and 1 minute apart. She was re-hypnotized at 4:35 P.M. She was then taken to the delivery room. The bag of water was artificially ruptured and she was asked to bear down.

A deep episiotomy and rather difficult low forceps were performed. The patient showed no sign of pain or distress, was completely relaxed and talked freely with the hypnotist (Dr. Kroger). An extensive perineorrhaphy was performed with the patient completely oblivious to what was happening. A silkworm-gut repair was used and the patient was then awakened. She was visibly surprised at her surroundings, exclaiming, "Where am I, how did I get in here, don't tell me I have had a baby." She looked at the clock and asked, "Where have I been since ten o'clock this morning?" The entire labor and delivery was witnessed by various members of the staff. When interrogated by members of the staff as to her subjective experience she stated that her mind was a complete blank, and if they were to ask her to write her experience down she would have to hand them a blank piece of paper.

Her puerperium was uneventful, she had no knowledge that the stitches were present until the sixth day. On the following day amnesia and anesthesia were produced over the telephone by Dr. Kroger. Dr. DeLee removed the stitches and awakened her. She was completely amnesic and anesthetic for this experience. This was witnessed by interns, nurses, and members of the staff.

She regards her experience as most pleasurable and stated, "I can't see why more women don't have babies this way."

Discussion

In a critical review of the world literature comprising hundreds of articles and books, not one authenticated fatality following the use of hypnosis has been reported.

Hypnosis has been relegated to an obscure position as an unexplained medical phenomenon because of popular disrepute by the laity.

Since medical men practice medicine according to the dictates of public policy, they hesitate to use this very valuable addition to our therapeutic armamentarium, not only because they are not conversant with its methodology, but because of the evil association of its origin.

How many more mothers and babies must die from anesthesia before the medical profession and laity will discard the prejudice and outmoded superstitions surrounding hypnosis?

From a practical standpoint, hypnosis fulfills all the desiderata of the ideal analgesic and anesthetic agent, namely, it alleviates suffering, does not interfere with the normal mechanism of labor and is safe for mother and baby.

The mechanism by which hypnosis and posthypnotic suggestion operates in relieving the pains of childbirth is fairly explainable, but requires a more fundamental type of investigation.

It may be considered that hypnosis is "synaptic ablation" and thus effectively blocks the somatic and autonomic pathways which transmit the afferent pain impulses to the higher sensorium. Another possibility is that through hypnosis, an effective control of the higher centers is exercised,²⁷ especially the fatigue, pain and memory centers in the hypothalamus. In some individuals, the pain threshold may be raised by hypnosis.

All physicians are aware of the powers of suggestions, and in the state of hypnosis, conscious resistance is reduced to a minimum. The patient is put in a state of heightened suggestibility and accepts suggestions without criticism.

Summary

Amnesia, analgesia and anesthesia were successfully induced in eleven patients. There was only one failure in our small series of cases. Ten of these were primiparas and one was a multipara. The hypnoidal state is a safe amnesic, analgesic and anesthetic agent. There are no untoward effects on the mother or baby and its many advantages are enumerated. Time worn superstitions, which prevent its use today by the medical profession should be discarded.

The value of the hypnoidal state in obstetrics should be assessed by others. Only then, can an objective evaluation be placed on its merits.

We desire to thank Drs. Wm. Dieckmann and J. P. Greenhill for their interest in this work.

References

1. DeLee, J. B., and Greenhill, J. P.: Year Book Obstetrics and Gynecology, Chicago, 1939, Year Book Publ. Co., p. 164.
2. DeLee, J. B., and Greenhill, J. P.: Principles and Practice of Obstetrics, Philadelphia, 1943, W. B. Saunders Co.
3. Kirsten, F.: Zentralbl. f. Gynäk. 46: 843, 1922.
4. Heberer, H.: Zentralbl. f. Gynäk. 46: 749, 1922.
5. Oettingen, K. Von.: München. med. Wehnschr. 68: 265, 1921.
6. Hartmann, L.: Lancet 1: 451, 1922.
7. Franke, U.: Deutsche med. Wehnschr. 50: 874, 1924.
Franke, U.: Deutsche med. Wehnschr. 49: 134, 1923; Zentralbl. f. Gynäk. 46: 89, 1922.
8. Schultze-Rhonhof, F.: Zentralbl. f. Gynäk. 47: 476, 1923.
9. Kogerer, H.: Zentralbl. f. Gynäk. 47: 889, 1922.
10. Falk, R.: Zentralbl. f. Gynäk. 46: 658, 1922.
11. Friedlander, H.: Zentralbl. f. Gynäk. 47: 89, 1923.
12. Hallauer, B.: Zentralbl. f. Gynäk. 46: 1793, 1922.
13. Siemerling, E.: Zentralbl. f. Gynäk. 46: 834, 1922.
14. Wolff, G.: Arch. f. Gynäk. 129: 23, 1926.

15. Erickson, M. H.: *Diseases of the Nervous System* 2: 13-18, Jan., 1941.
16. Bramwell, J. M.: *Hypnotism: Its History, Practice and Theory* (Rev. Ed.), Philadelphia, 1928, J. B. Lippincott Co.
17. Schilder, P., and Kauders, O.: *Hypnosis, Nerv. and Ment. Dis. Monog.*, Washington, D. C., No. 46, 1927.
18. Young, P. C.: *Psychological Bulletin* 28: May, 1931.
Young, P. C.: *Hypnotism, Psychological Bull.* 23: Sept., 1926.
19. Erickson, M. H.: *M. Record* 140: 609, 1925.
20. Kellogg, E. R.: *J. Exper. Psychol.* 12: 502, 1929.
21. Patten, E. F.: *J. Abnorm. Social Psychol.* 25: 319, 1930.
22. Erickson, M. H.: *J. Gen. Psychol.* 24: 95, 1941.
23. Kroger, W. S.: *J. A. M. A.* 120: 714, 1942.
24. Williams, G. W.: *J. Abnorm. and Social Psychol.* 24: 318, 1929.
25. Williams, G. W.: *Am. J. Psychol.* 22: 83, 1930.
26. DeLee, J. B., and Greenhill, J. P.: *Year Book Obstetrics and Gynecology*, Chicago, Year Book Publ. Co., p. 126, 1937; p. 174, 1939; p. 165, 1940.
27. Hull, C. L.: *Hypnosis and Suggestibility*, New York, 1933, D. Appleton-Century Co.

55 EAST WASHINGTON STREET
104 SOUTH MICHIGAN AVENUE

Koller, T.: The Question of Thrombosis and Embolism in Obstetrics and Gynecology, Schweiz. med. Wchnschr. 73: 85, 1943.

At the Zurich Clinic, the author found that from 1922 through 1941, there were 494 cases of thrombosis and embolism in the obstetric and 394 instances on the gynecologic services. The death rate in the obstetric series was only 1.4 per cent as contrasted with 12 per cent for the gynecologic series. The frequency of thrombosis and embolism following the various types of delivery was as follows: spontaneous delivery 1 per cent, all types of vaginal operative deliveries 2.6 per cent, forceps 4.2 per cent, manual removal of the placenta 5.2 per cent and cesarean section 7.2 per cent. The frequency of thrombosis and embolism among the gynecologic patients was as follows: vaginal operation 0.55 per cent, abdominal operations 3.5 per cent.

Among 35,204 labor cases the frequency of fatal embolism was 0.2 per cent and distributed as follows: one death for every 3,000 spontaneous deliveries, 1 death in 1,700 vaginal operative deliveries and 1 death after 300 cesarean sections.

The factors which are particularly favorable for thrombosis and embolism are age past 40, preoperative increase in sedimentation rate, malignancy, fibromyomas, cardiac circulatory diseases and varicosities and obesity.

Prophylactic measures are as follows: (1) Careful placing of indications for operation; (2) Early bed exercises following operation including massage, early rising, elevation of the foot of the bed; and (3) Abundant fluids postoperatively, alkali diet (chiefly fruits and vegetables) and where necessary stimulation of the circulation.

J. P. GREENHILL.

THE BASAL METABOLIC RATE, BASAL BODY TEMPERATURES, AND THE OVARIAN CYCLE*

W. W. WILLIAMS, M.D., SPRINGFIELD, MASS.

(From the Springfield Hospital)

THOSE who have conducted any considerable number of basal metabolic determinations have inevitably experienced difficulty in basing the clinical dose of thyroid extract upon the basal metabolic reading. When the tolerance to thyroid extract is not in accord with what might be anticipated from the basal metabolic reading, the question arises as to a possible error in the conduct of the test, whether there might be some other condition than thyroid deficiency which has caused the low basal metabolic rate and in which thyroid extract is contraindicated, or whether there may have developed a peculiar lack of tolerance to thyroid extract in one who over a long period of time has become adjusted to a thyroid deficit. Such discrepancies are indeed so common that many physicians have lost confidence in the results obtained by the use of a metabolator and decide on the desirability of thyroid medication or surgery more upon clinical considerations. In the writer's cases, the rather arbitrary practice has been followed of estimating the thyroid dosage as one grain for about each 6 per cent reduction in the basal metabolic rate below a minus 10 per cent, and although this has worked satisfactorily as a rough measure of thyroid tolerance, there have been a number of cases with readings as low as minus 33 per cent that have failed to clinically tolerate as small a dose as 0.5 grain, while in others with a rate as high as minus 18 per cent have tolerated as much as 3 to 4 grains, and improved clinically in consequence. In all cases in which thyroid extract has been given, the weight and basal pulse rate has been recorded every two or three days and used as a guide for thyroid extract administration. The thyroid dosage was reduced if there was a marked increase in the pulse rate or a reduction in the weight or if other symptoms indicative of excessive thyroid dosage developed. In a few of the cases, the weight was reduced by dietary measures after the thyroid tolerance had been established, but not before.

Barnes¹ has suggested the employment of a record of basal body temperatures as a means of overcoming some of the failures inherent to the problem of establishing the correct therapeutic dose of thyroid extract. He states, "In over 1,000 cases in which the basal metabolic rate has been found subnormal, the body temperature has never been found up to normal unless an infection was present;" and he expressed the opinion that "subnormal body temperature is a better index for thyroid therapy than the basal metabolic rate."

*Presented at the Staff Meeting of the Springfield Hospital, May 15 1943.

This rather novel suggestion prompted the examination of some of my case records to see if this relationship pertained to them, and to determine whether the basal body temperatures* could be employed in routine clinical cases for regulating thyroid therapy. For this purpose 35 consecutive cases were studied. The data here presented are the result of that analysis. The basal metabolic rates of the 35 cases ranged from minus 34 per cent to plus 10 per cent, and all of them had had daily basal temperature recordings for periods ranging from 2 to 12 months. Some had received no thyroid extract, others thyroid extract during the entire period and still others for only part of the time. All were extremely healthy individuals although the appearance of two or three of them was mildly suggestive of hypothyroidism. None were outspoken hypothyroids. None of them presented any nutritive disorder or infection that might reasonably be expected to affect the temperatures or the basal metabolic rates.

Five out of the 35 cases received no thyroid extract. Their basal metabolic rates ranged from minus 22 per cent to plus 10 per cent. One of this group (Case No. 244, B.M.R., minus 16 per cent) presented an abnormally high temperature level because of pregnancy. The temperature levels of the rest were normal. (Table I.)

TABLE I. BASAL BODY TEMPERATURE RECORDS OF CASES RECEIVING NO THYROID EXTRACT

CASE NO.	B.M.R.	GRAINS THYROID	RANGE TEMP. SHIFT IN DAYS	MEAN OVULATION DAY	DAYS VARIATION IN OVULATION	GROSS CYCLIC TEMP. RANGE	MAXIMUM DEGREES TEMP. VARIATION	DEGREES OVULATION DEPRESSION
51	+4.5	0	5-21	16	16	97-99	2.0	0.2
167	-22	0	none	none	--	97.8-98.2	0.4	none
188	+10	0	11-14	13	3	97.5-98.8	1.3	0.3
237	-11.5	0	9-12	10	3	97.6-99	1.3	0.4
244	-16	0	none	none	none	98.6-99	0.4	none

In Table II is recorded the basal temperatures of 17 women whose basal metabolic rates ranged between minus 15 per cent and minus 4 per cent and who had received thyroid extract for a part or all of the period during which basal body temperatures were being recorded. One individual out of this group (No. 185, B.M.R., minus 12 per cent) presented low temperatures at ovulation time in 2 out of 8 cycles. The temperature levels of the other members of the group all fell within normal limits, in spite of the different basal metabolic rates and different sized thyroid dosage. Thyroid tolerance with various members of this group was attained with doses of thyroid extract ranging from 0.5 to 2 grains daily. Three cases (Nos. 220, 247, 257) ran temperatures slightly higher than the normal level during the proliferative phase of

*The cases were drawn from the female sterility studies in which daily basal body temperatures have been recorded for purposes of ovulation timing and the recognition of ovular diseases. Such studies are essentially routine in sterility work-ups and thus furnish an abundant record of basal body temperatures.

their cycles. All three gave evidence of abnormal ovulation, and the temperature levels were the same whether receiving thyroid extract or not. None of the cases have given any evidence of the ability of thyroid extract to elevate the temperature of cases with lowered basal metabolic rates.

With the thirteen cases whose basal metabolic rates ranged between minus 15 per cent and minus 34 per cent only one (No. 221, B.M.R. minus 19 per cent) presented abnormal temperature levels. This case, although having a basal metabolic rate of minus 19 per cent, tolerated

TABLE II. BASAL BODY TEMPERATURE RECORDS OF CASES WITH B.M.R. RANGING BETWEEN MINUS 15% AND MINUS 4%, AND GIVEN THYROID EXTRACT IN DIFFERENT SIZED DOSES

CASE NO.	B.M.R.	GRS. THYROID	RANGE OF TEMP. SHIFT IN DAYS	MEAN DAY OF OVULATION	DAYS VARIATION IN OVULATION	GROSS CYCLIC TEMP. RANGE	MAXIMUM DEGREES TEMP. VARIATION	DEGREES OVULATION DEPRESSION
177	0	½	15-21	17	6	97.4-99	1.5	0.4
184	-8.5	i	5-19	14	14	97.2-98.8	1.6	0.2
185	-12	½	10-19	12	9	96.6-98.6	2.0	0.3
187	-14	ii	12	12	-	97.5-98.6	1.0	0.3
204	-15	ii	7-15	12	8	97.0-99	2.0	0.4
217	-10	i	12-29	18	17	97.4-98.6	1.2	0.4
220	-7.5	i	9-18	13	9	98.2-98.9	0.7	0.3
229	-15	i	12-14	13	2	97.4-99	1.5	0.5
232	-11	½	12-17	14.5	5	97.5-98.9	1.4	0.5
233	-11	i½	9-10	9.5	1	97.8-99	1.1	0.2
242	-13.5	i	4-16	12	12	97.8-99.4	1.6	0.4
243	-15	ii	13-16	15	3	97.5-99	1.5	0.4
247	-15	i	10-22	16	12	98.0-99.2	1.2	none
251	-8.5	i	11-14	13	3	97.6-99	1.4	0.2
255	-13	ii	6-14	10	8	97.3-99	1.7	0.6
257	-15	i	none	none	none	98.0-98.6	0.6	none
258	-4	½	8-10	9	2	97.6-99	1.3	0.4

TABLE III. BASAL BODY TEMPERATURE RECORDS OF CASES WITH BASAL METABOLIC RATE RANGING BETWEEN MINUS 34% AND MINUS 16%, AND GIVEN THYROID EXTRACT IN DIFFERENT SIZED DOSES

CASE NO.	B.M.R.	GRS. THYROID	RANGE OF TEMP. SHIFT IN DAYS	MEAN DAY OF OVULATION	DAYS VARIATION IN OVULATION	GROSS CYCLIC TEMP. RANGE	MAXIMUM DEGREES TEMP. VARIATION	DEGREES OVULATION DEPRESSION
151	-22	ii	12-15	13	3	97.8-99	1.2	0.3
196	-30	ii	9-15	12	6	97.6-98.8	1.2	0.3
210	-26	ii	8-20	16	12	97.5-98.9	1.4	0.3
215	-16	i	11-33	13	22	97.4-98.8	1.4	0.3
219	-26	ii½	13-14	13.5	1	97.8-98.8	1.0	0.2
221	-19	½	9-15	12	6*	98.0-99.2	1.2	0.6
241	-20	ii	none	none	none*	97.6-98.6	1.0	none
245	-29	v	11-15	12	4	97.3-98.5	1.2	0.3
248	-34	v	11-18	14	7	97.3-98.8	1.5	0.7
249	-19	v	11-19	15	8	97.6-99	1.4	none
250	-18.5	iii	11-15	13	4	97.7-98.3	1.6	0.3
254	-24	iii	12-13	13		97.6-98.6	1.0	
259	-24	iv	11-16	13	5	97.2-98.2	1.0	0.4

*Usually very narrow range.

only 0.5 grain of thyroid extract daily. For 9 consecutive cycles during which 0.5 grain thyroid extract was administered part of the time, the temperature level was uniformly too high, and then the temperature level became normal. None of the cases with basal metabolic rates of minus 15 per cent or less ran any abnormally low temperatures during periods of from 2 to 12 months of daily temperature recordings.

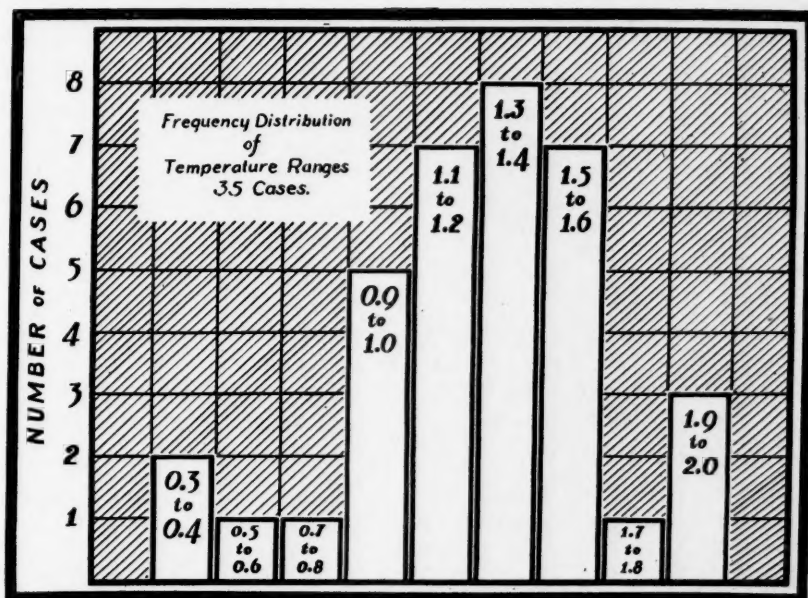


Fig. 1.—Frequency distribution of maximal cyclic temperature variations in 35 women.

In appraising the possible effect of the basal metabolic rate upon the basal body temperature of women, one must necessarily take into consideration the ordinary cyclic temperature variations of ovulating women. During the first half of the cycle an average temperature level of about 98 degrees is usually maintained, often followed by an abrupt but brief drop of 0.3 to 0.4 degrees and then a shift to a higher temperature level which continues at about 98.5 degrees until one to three days before the onset of the next menses. The time of the shift from the low to the high temperature plateau marks the time of ovulation. This general temperature pattern is quite constant to normal ovulating women, but varies greatly with pathologic ovulation. Normal ovulating women commonly present each cycle a temperature variation of 0.9 to 1.6°. The low point falls on the day of ovulation, the high point a few days later and the variation ranges between about 97.2 and 99 degrees Fahrenheit. Therefore, normal temperature variations of ovulating women cannot be considered as pathologic unless they are not the result of the normal ovarian cycle. (Figs. 1 and 2.) The temperatures of all the 35 cases cited in this paper kept within

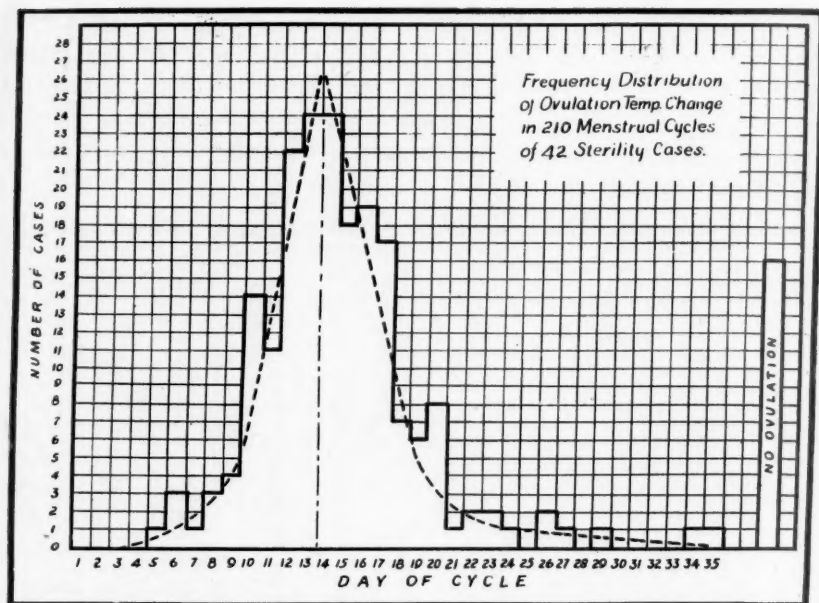


Fig. 2.—Frequency distribution of ovulation temperature change with forty-two women, 210 cycles.

this range of normal variability excepting for a few sporadic temperatures due either to ovulation or illness.*

If the basal metabolic rates within the ranges here presented were capable of affecting the temperature level, one should expect to find that the group of cases with the lower basal metabolic rates would present over a period of several months with daily temperature recordings, a somewhat lower average minimal and maximal temperatures

TABLE IV. RELATION OF THE BASAL METABOLIC RATE TO THE AVERAGE MINIMAL AND MAXIMAL TEMPERATURES RECORDED WITH 42 CASES WITH DAILY TEMPERATURE READINGS COVERING 210 MENSTRUAL CYCLES

	AVERAGE MINIMAL TEMP.	AVERAGE MAXIMAL TEMP.	MAXIMUM DEGREES TEMP. VARIATION
B.M.R. Minus 22% to plus 10%. No thyroid extract. (5 cases)	97.7	98.8	1.1
B.M.R. Minus 15% to minus 4%. Thyroid extract to clinical tolerance in part of cycles. (17 cases)	97.5	98.9	1.4
B.M.R. Minus 16% to minus 34%. Thyroid extract to clinical tolerance in part of the cycles. (13 cases)	97.6	98.7	1.1

*Since the preparation of this paper, a record of the basal body temperatures and the basal metabolic rate has been obtained with an additional 70 women. Two of these had uniformly lower basal body temperatures than previously encountered, one with temperatures ranging between 96.6 and 97.8, the other between 97.2 and 98 degrees throughout two to three cycles. The former had a B.M.R. of plus 5 per cent, and the latter a B.M.R. of plus 12 per cent. This is rather the opposite effect to what might be anticipated, that the cases with the higher B.M.R. of the series should present the lowest basal body temperatures.

than the group of the series with the higher basal metabolic rates. Such, however, was not the case. (Table IV.) Again comparing the extremes of basal metabolic rates of the series, it is found that the case with the highest rate (No. 188, B.M.R. plus 10 per cent) had a temperature range of 97.5 to 98.8 degrees, in contrast to a temperature range of 97.8 to 98.2 degrees with the case with the lowest B.M.R. that received no thyroid extract (Case No. 167, B.M.R. minus 22 per cent), suggesting that a difference of as little as 30 to 40 per cent in the basal metabolic rate is hardly sufficient to influence the basal body temperature level.

Summary

The records of 35 routine clinical cases with basal metabolic rates ranging between plus 10 per cent and minus 34 per cent were examined to determine (1) what if any relationship existed between the basal metabolic rates and the basal body temperatures, and (2) the feasibility of using basal body temperatures as an index to thyroid therapy. These studies have not confirmed Barnes' observation of the relationship between the basal body temperature and basal metabolic rate, nor given any evidence that the basal body temperatures of this series of cases has been influenced by the administration of thyroid extract in doses as high as could be clinically tolerated.

References

1. Barnes, Broda: J. A. M. A. 119: 1072, 1942.
2. Rubenstein, Boris B.: Ohio State M. J. 35: 1066, 1939.
3. Zuck, Theodore T.: Ohio State M. J. 35: 1200, 1939.
4. Zuck, Theodore T., and Duncan, David R. L.: AM. J. OBST. AND GYNEC. 38: 310, 1939.
5. Williams, W. W., and Simmons, F. A.: Urol. and Cutan. Rev. 46: 558, 1942.

Barns, H. H. Fouracre: Maternal Birth Palsy Due to Trauma, J. Obst. & Gynaec. Brit. Emp. 50: 13, 1943.

The author reports three cases of maternal birth palsy. A general review of the etiology of this condition is given. The lumbosacral cord is compressed, as it lies on the ala of the sacrum, by the fetal head. Instrumentation and repeated attempts at forceps delivery in difficult labors may aggravate this condition. The author describes the clinical syndrome. The chief clinical signs are severe cramps and pain or paresis in the legs during labor. The author goes as far as advising cesarean section in such patients where the danger of instrumentation might aggravate the above symptoms. This is especially true if the child is normal and alive.

WILLIAM BERMAN.

THE TRANSFER OF SODIUM ACROSS THE HUMAN PLACENTA

Preliminary Report

ALFRED GELLHORN, M.D.,* LOUIS B. FLEXNER, M.D., AND
LOUIS M. HELLMAN, M.D., BALTIMORE, Md.

(From the Department of Embryology, Carnegie Institution of Washington, and the Department of Obstetrics, Johns Hopkins University and Hospital)

THIS investigation was undertaken with the view of establishing in man the characteristics of placental transfer of sodium at various stages of gestation both in normal and pathological conditions. Eleven observations in 10 cases are now at hand. This is an inadequate series for the original purposes of the study. The observations, together with tentative comments, are recorded here, however, because they are unique and were obtained only after considerable effort and expense, and because it is improbable that the studies can be resumed for some time to come.

The observations were made in 10 pregnant women in whom pregnancy was terminated by abdominal hysterotomy. The indications for operation are listed in the table. Radiosodium present as the chloride in isotonic solution with an activity of 0.3 to 0.5 millicurie, was injected intravenously into the mother. This amount of radioactivity is known to be innocuous to mother and fetus.^{1, 2} At a known interval of time after injection, usually 30 minutes, fetus and placenta were delivered and a sample of maternal venous blood was taken. Radioactivity in the maternal plasma and the ashed remains of the non-viable fetus was measured with a pressure ionization chamber-string electrometer.³ When a viable fetus was obtained, a sample of fetal blood was taken by venipuncture after time was allowed for equilibration of the radiosodium within the extracellular fluids and the radioactivity of the blood sample was then measured. The total radiosodium transferred to the fetus in such an instance was calculated on the assumption that 30 per cent of the body weight was available for dilution of the radiosodium.⁴ The rate of transfer of sodium was derived from these data as previously noted.⁵ The duration of gestation was calculated from the menstrual history.

The observations are presented in the table and permit two tentative conclusions. In both those cases where placental transfer is judged to approach closely the normal (cases 1, 3, 5, 7, 9, 10) and in those remaining where abnormal alterations may be more readily suspected,

*Now of the Department of Physiology, College of Physicians and Surgeons, Columbia University, New York City.

there is clearly an increase in rate of transfer per unit weight placenta with increase in gestation age. The overall increase, noted from 10 to 38 weeks, is 7 times. This finding corresponds qualitatively with that observed in all placentas previously studied.^{3, 6-10} It is also apparent from the table and from previously published data that the rate of transfer of sodium per gram placenta per hour in man appears to be closely like that reported for other hemochorial placentas at corresponding periods of gestation.^{3, 5-7}

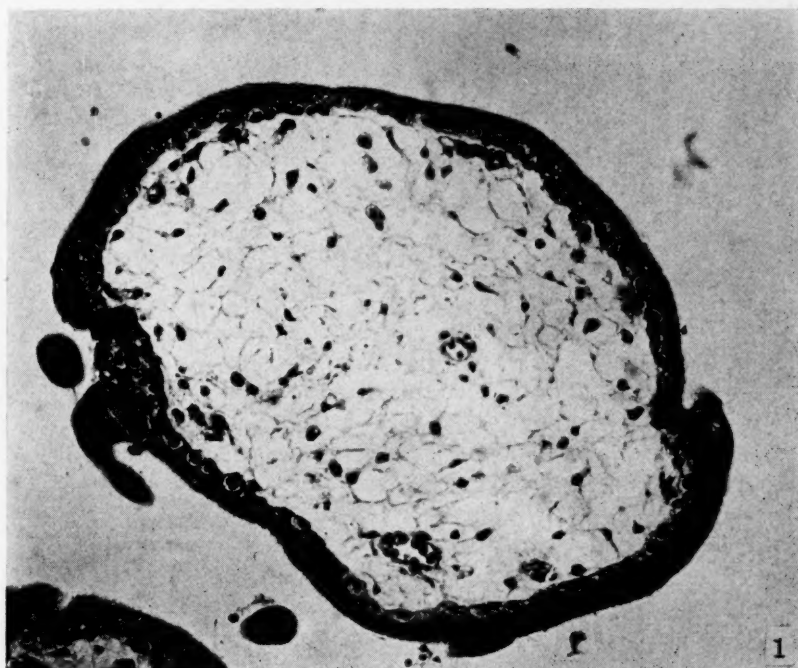


Fig. 1.—Human placenta from 12 weeks' pregnancy. $\times 000$.

TABLE I

CASE NO.	HISTORY NO.	INDICATION FOR OPERATION	GESTA-TION AGE	WEIGHT FETUS (GM.)	WEIGHT PLA-CENTA (GM.)	TOTAL Na TRANS. TO FE-TUS/HR. (MG.)	TRANS-FER Na/GM. PLACEN-TA/HR. (MG.)
1	231656	Schizophrenia	10 wks.	36.0	63.0	48.5	0.76
2	240415	Chronic nephritis	12 wks.	14.3	33.6	46.0	1.37
3	257328	Epilepsy	12 wks.	19.0	33.5	19.1	0.57
4	165446	Chronic hypertension	16 wks.	129.4	100.0	170.5	1.70
5	247063	Schizophrenia	16 wks.	402.3	126.0	295.0	2.34
6	259938	Chronic hypertension	20 wks.	361.1	140.4	400.0	2.85
7	249863	Feeble-minded	20 wks.	544.5	156.1	726.0	4.66
8	250383	Chronic hypertension	24 wks.	613.5	168.0	802.0	4.76
9	260095	Previous section	37 wks.	2,180.0	213.5	1,036.0	4.86
				2,030.0	205.0	370.0	3.41
10	103003	Previous section	38 wks.	2,700.0	370.0	1,966.0	5.32

This increase in rate of transfer of sodium per unit weight placenta with increase in gestation age can be related to morphological changes which occur as the placenta ages. The photomicrographs in Figs. 1, 2, 3, and 4 are typical of placentas of 12, 19, 28, and 37 weeks. They are all taken at the same magnification and show clearly some of the important alterations in this organ as gestation progresses. At 12 weeks, the villi are large, relatively few in number and covered with a double layer of cells, the outer, syncytial and the inner, cellular known as Langhans' layer. At 19 weeks, there is an increase in the

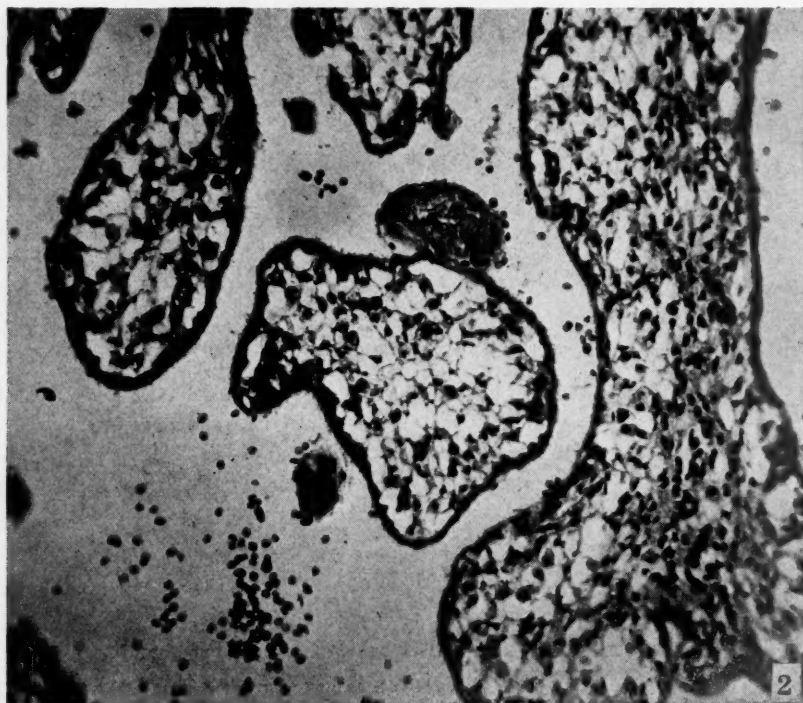


Fig. 2.—Human placenta from 19 weeks' pregnancy. $\times 000$.

number of villi, a decrease in their size and the Langhans' layer has almost completely disappeared. The increase in number and decrease in cross-sectional area of villi, together with thinning of their walls, continues through the twenty-eighth week to term. Higher magnification reveals in addition, as pregnancy proceeds, an increase in number of fetal capillaries within the stroma of the villus together with a decrease in the thickness of the capillary walls. All of these morphological changes provide an interpretation of the increase in transfer rate per unit weight placenta which has been observed as pregnancy progresses.

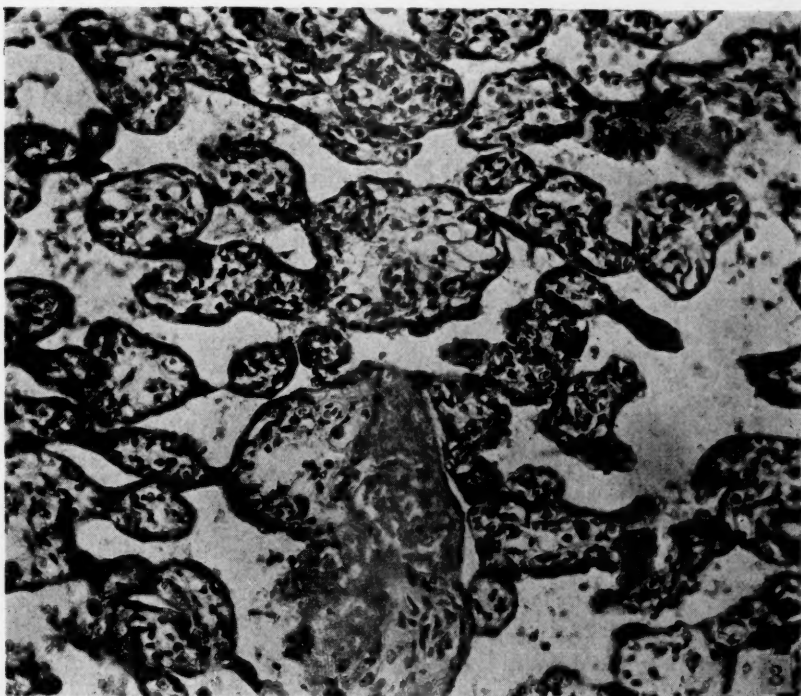


Fig. 3.—Human placenta from 28 weeks' pregnancy. $\times 000$.

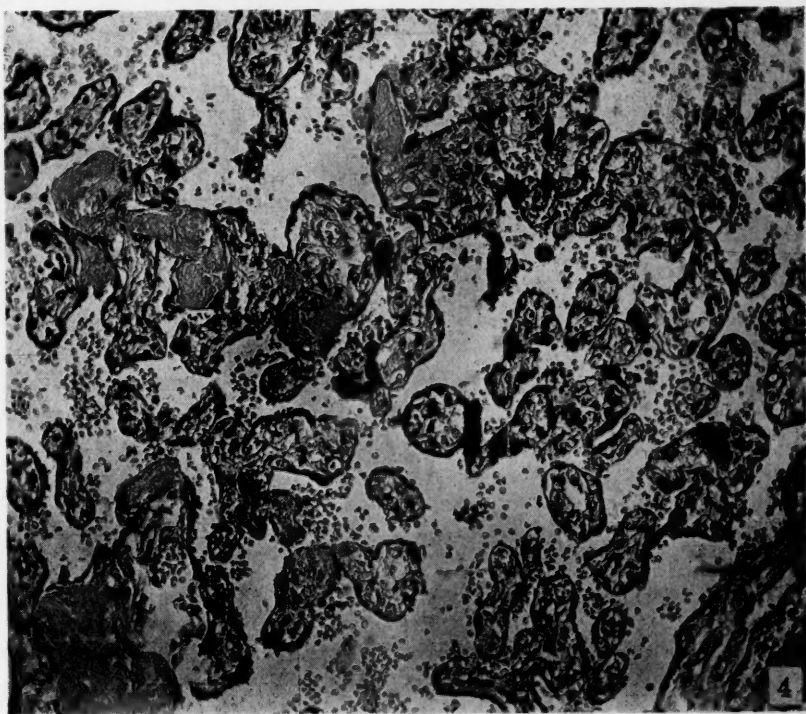


Fig. 4.—Human placenta from 40 weeks' pregnancy. $\times 000$.

Conclusions

Although the data are insufficient for precise quantitative conclusions, they indicate that in man the rate of transfer of sodium per unit weight placenta increases markedly as gestation proceeds. This change can be correlated with morphological changes which occur in the human placenta. Sodium appears to be transferred across a unit weight of the human placenta at about the same rate found in other hemochorial placentas at corresponding periods of gestation.

We are grateful to Dr. N. J. Eastman for his interest and generous cooperation. We also wish to express our warm appreciation to Dr. B. R. Curtis, Department of Physics, Harvard University, for preparing the radiosodium in the Harvard cyclotron.

References

1. Mullins, L. J.: *J. Cell. & Comp. Physiol.* **14**: 403, 1939.
2. Abels, J. C., Kenny, J. M., Craver, L., Marinelli, L. D., and Rhodes, C. P.: *Cancer Research* **1**: 771, 1941.
3. Flexner, L. B., Pohl, H. A.: *Am. J. Physiol.* **132**: 594, 1941.
4. Shohl, A. T.: *Mineral Metabolism*, New York, 1939, Reinhold Publishing Corporation.
5. Flexner, L. B., and Gellhorn, A.: *AM. J. OBST. AND GYNEC.* **43**: 965, 1942.
6. Flexner, L. B., and Pohl, H. A.: *J. Cell. & Comp. Physiol.* **18**: 49, 1941.
7. Flexner, L. B., and Pohl, H. A.: *Am. J. Physiol.* **134**: 344, 1941.
8. Pohn, H. A., and Flexner, L. B.: *J. Biol. Chem.* **139**: 163, 1941.
9. Pohl, H. A., Flexner, L. B., and Gellhorn, A.: *Am. J. Physiol.* **134**: 338, 1941.
10. Gellhorn, A., Flexner, L. B., and Pohl, H. A.: *J. Cell. & Comp. Physiol.* **18**: 393, 1941.

RECTAL STRICTURE COMPLICATING LABOR

An Analysis of Forty-Eight Cases

IRWIN H. KAISER, M.D.,* BALTIMORE, Md.

(From the Department of Obstetrics, the Johns Hopkins University and Hospital)

STRICTURE of the rectum as a complication of labor has received increasing attention in recent years as its potential gravity has become recognized. The literature on the subject to date consists of reports of thirty labors, and this paucity of material makes evaluation of the problems involved difficult. It was therefore decided to review the experience of the department of obstetrics of the Johns Hopkins Hospital, which comprises forty-eight labors complicated by rectal stricture.

Review of Literature

The earliest reference to stricture of the rectum complicating labor is apparently that by Dorsett¹ in 1920. The case is an excellent example of the syndrome associated with rupture of the rectum. The patient was a 37-year-old para iii, gravida iii, who had been delivered at home

*In active military service.

by forceps. Shortly thereafter she complained of severe pain in the left side and went into shock. About twelve hours post partum, signs of generalized peritonitis appeared and the patient was transferred to the hospital. She was found markedly distended with all signs of peritonitis and died shortly after admission, forty-two hours post partum. Autopsy revealed stricture of the rectum with transverse rupture into the peritoneal cavity at the rectosigmoid junction.

Kassebohm and Schreiber² reported two further deaths in 1936. One occurred in a para ii, gravida ii, who had a stricture and rectovaginal fistula. The patient delivered spontaneously after an uneventful labor, but seven hours post partum was found in profound shock with abdominal distention and rigidity. She died nine hours thereafter, and autopsy revealed rupture of the rectum. Their other case was a primipara delivered by midforceps who died early post partum. No autopsy is described.

The fourth fatal case is that of Gaines and MacDowell,³ reported in 1936. The patient was a 19-year-old primipara who fell into labor spontaneously at term. She was found to have a rectal stricture admitting a fingertip and involving the rectovaginal septum. Maternal condition was poor during labor and when the fetal vertex crowned, forceps were attempted unsuccessfully. Delivery was accomplished by version and extraction. The mother went rapidly into shock, with signs of peritonitis, and died five and one-half hours post partum. Autopsy revealed rupture of the rectum into the peritoneal cavity. On the basis of this case, the authors recommend cesarean section for delivery of these patients.

Kassebohm and Schreiber⁴ in 1937 reported a series of eighteen labors including the two deaths reported in their paper of 1936. The eighteen cases resulted in fifteen spontaneous deliveries and three forceps operations. Drawing attention to the excessive maternal mortality, they recommend therapeutic abortion where feasible in all patients with rectal stricture, delivery with wide or bilateral episiotomy and routine sterilization.

Anderson⁵ in 1938 reported a fifth death. The patient was 22 years old and had had a previous difficult forceps delivery. She was found to have a rectal stricture with thickening of the rectovaginal septum, and a rectovaginal fistula. After twelve hours of labor, with the cervix almost fully dilated and membranes ruptured for nine hours, the fetus was delivered by version and extraction. Uterine exploration revealed rupture of the uterus in the lower uterine segment. The rupture was repaired at laparotomy, but the patient died in eight hours. In the same year, Michelson⁶ reported a normal uncomplicated delivery in a patient with rectal stricture.

Vignes,⁷ in 1939, reported two further cases. One was delivered by cesarean section for malpresentation and was found to have rectal stricture post partum. The second had a sixty-two hour labor terminated by a difficult forceps delivery. This was followed by signs of peritonitis and death in thirteen hours. No autopsy was obtained, but exploration proved the birth canal to be intact. The same author refers elsewhere⁸ to a patient with colostomy for rectal stricture who suffered no complications in her three deliveries. This is the only case recorded in the literature of a patient who had more than one delivery in the presence of rectal structure. In 1940, Vignes⁹ reported a

30-year-old primipara who was found to have a stricture and recto-vaginal fistula after eleven and one-half hours of poor labor and was treated by radical cesarean section, with recovery. Fagarasano,¹⁰ in the same year, reported a patient in whom he performed an abdomino-perineal bowel resection for rectal stricture with re-establishment of a perineal rectum. The patient delivered a 2,860 Gm. infant uneventfully seven months later.

The most recent report is that of Pollard and Hellendahl¹¹ in 1942. The patient, a secundipara, was delivered by breech extraction. Four hours post partum cramps and signs of peritonitis developed; death occurred twenty-one hours post partum. Autopsy revealed rupture of the rectum. These authors suggest bowel surgery early in pregnancy.

These thirty labors are presented in summary form in Table I.

Experience of the Johns Hopkins Hospital

Forty-eight deliveries in thirty-one patients suffering from rectal stricture, with one maternal death, have been found in the records of the Johns Hopkins hospital. More than one-third of these cases have been observed in the last five years. Labors not occurring under the supervision of the department of obstetrics have been excluded from this study.

At the time of delivery the parity of the patients was:

Para 0:11 cases

1:10

2:9

3:5

4:7

5:4

6:1

7:1

Twenty-three patients, or 73 per cent of the entire group, have had but one delivery under our observation after the diagnosis of rectal stricture. Three patients have had two deliveries, one has had three, and four had four deliveries. The series of multiple deliveries is therefore small, and no conclusions as to the effect of multiparity on rectal stricture can be reached. No patient suffered an exacerbation of the rectal stricture during pregnancy.

Sixteen patients, or 52 per cent of the thirty-one, had proved syphilis at some time, as compared with a rate of 22 per cent for the past five years among Negro dispensary patients. The latter group will be used as a control series throughout this study, since thirty of the thirty-one patients and forty-seven of the forty-eight deliveries occurred in Negro women. This high rate of syphilis is not remarkable in a series of patients, the majority of whom have suffered from lymphopathia venereum.

Thirty-one deliveries occurred in patients with normal pelves, thirteen in the presence of slight contraction, and three in patients whose diagonal conjugate was 10.5 cm. One pelvis was unmeasured.

Detailed information about the rectal strictures in this series is not to be found in the records, unfortunately, except in a few recent cases. Many are described only by the statement that the stricture would not "admit a fingertip." It can be stated, however, that twenty deliveries, or 43 per cent, occurred in the presence of a rectal stricture which would not pass a fingertip at some time prior to delivery, or one asso-

TABLE I. THIRTY LABORS IN THE PRESENCE OF RECTAL STRICTURE RECORDED IN THE LITERATURE

AUTHOR	AGE	PARITY	DURATION OF LABOR	TYPE OF DELIVERY	FETAL WEIGHT	COMPLICATIONS
1. Dorsett	37	3	?	Forceps	?	Peritonitis and death—rupture of rectum proved at autopsy
2. Kassebohm and Schreiber	32	2	3+ Hrs.	Spontaneous	5-11	Peritonitis and death—rupture of rectum proved at autopsy
3. <i>ibid.</i>	24	0	?	Midforceps	?	Death early post partum—no autopsy
4. Gaines and MacDowell	19	0	24	Version	3060	Peritonitis and death—rupture of rectum proved at autopsy
5. Kassebohm and Schreiber	31	3	?	Spontaneous	5-7	Febrile puerperium
6. <i>ibid.</i>	24	2	?	Spontaneous	6-6	Febrile puerperium
7. <i>ibid.</i>	26	0	?	Spontaneous	5-1	
8. <i>ibid.</i>	31	5	?	Spontaneous	7-12	
9. <i>ibid.</i>	26	1	?	Cesarean	6-12	
10. <i>ibid.</i>	29	0	?	Midforceps	7-6	Febrile puerperium
11. <i>ibid.</i>	20	0	?	Spontaneous	7-7	Febrile puerperium
12. <i>ibid.</i>	26	2	?	Spontaneous	5-7	
13. <i>ibid.</i>	22	1	?	Spontaneous	7-14	
14. <i>ibid.</i>	29	4	?	Spontaneous	6-5	Febrile puerperium
15. <i>ibid.</i>	22	3	?	Spontaneous	6-6	Febrile puerperium
16. <i>ibid.</i>	20	1	?	Spontaneous	5-7	
17. <i>ibid.</i>	31	1	?	Spontaneous	8-4	
18. <i>ibid.</i>	25	0	?	Spontaneous	2-13	
19. <i>ibid.</i>	23	5	?	Spontaneous	7-3	Febrile puerperium
20. <i>ibid.</i>	25	2	?	Spontaneous	7-4	
21. Anderson	22	1	12	Version	?	Rupture of uterus, laparotomy and repair, death in shock
22. Michelson et al.	34	0	?	?	?	
23. Vignes	?	0	?	Cesarean	?	Partial bowel obstruction in puerperium
24. <i>ibid.</i>	?	?	62	Forceps	?	Early death post partum—uterus, cervix and vagina intact—no autopsy.
25. Vignes	?	?	?	Spontaneous	?	(This case, and No. 26 and No. 27 all in the same patient). Colostomy
26. <i>ibid.</i>	?	?	?	Spontaneous	?	
27. <i>ibid.</i>	?	?	?	Spontaneous	?	
28. Vignes	30	0	13	Cesarean	3050	Multiple perineal fistulas, severe stricture and dystocia
29. Fagarasano	?	?	?	Spontaneous	2860	Delivery 7 months after bowel resection and perineal colostomy
30. Pollard et al.	32	1	8½	Breech	?	Peritonitis and death—rupture of rectum proved at autopsy

ciated with a rectovaginal fistula. In twenty-two cases, lesser degrees of stricture existed. In five, no description is available except that a stricture was present. Two patients suffered rectovaginal fistula, and one had severe lymphopathia venereum with multiple perineal fistulas. Another suffered elephantiasis of both legs. Two patients came to delivery with previous colostomies, and one of these had had a previous ablation of the rectum.

Other ante-partum complications observed in these forty-eight pregnancies were few in number, and so clearly incidental that they require no detailed description.

At the onset of labor, forty fetuses, or 83 per cent, were in normal vertex presentation and three in breech. One premature fetus lay in a transverse position. In four the presentation was not stated.

Method of delivery was as follows: spontaneously by vertex: thirty-four deliveries, or 71 per cent; forceps to the vertex including one mid-forceps: five deliveries, or 10 per cent; breech extraction: three deliveries, or 6 per cent; version and extraction: one delivery; spontaneous evolution of a compound presentation; one fetus. There were five cesarean sections, or 10 per cent. This is approximately twice the clinic average.

The duration of labor in the forty-three pelvic deliveries comprising this series is compared in Table II with Peckham's data¹² for 7,117 such deliveries in Negroes at the Johns Hopkins Hospital.

TABLE II

TIME (HOURS)	0-11	12-17	18-23	24-29	30—	TOTAL
Peckham's series—%	46.32	23.00	12.63	8.12	9.92	99.99
Expected cases in 43 cases according to Peckham's data	20.0	9.9	5.3	3.5	4.3	43.0
Observed	17	13	5	5	3	43.0

This comparison has been carried out with corrections for parity and the differences are not statistically significant. There is no evidence therefore that rectal stricture is associated with prolongation of total labor.

Duration of the second stage in this group is compared in Table III with a series of 795 deliveries, made up of all pelvic deliveries in Negroes in this hospital in 1942.

TABLE III

HOURS	0-½	½-2	2-3	3-4	4—	UN-KNOWN	TOTAL
Control—%	47.3	34.3	3.1	0.9	1.1	13.5	100.2
Expected cases in 43 at control rates	20.3	14.7	1.3	0.4	0.5	5.8	43
Observed	12	11	3	0	2	15	43.0

There is, therefore, no significant incidence of prolonged second stage. Three patients with little scarring of the pelvic soft tissues manifested uterine inertia throughout labor, and in each case the prolonged second stage was associated with failure of the vertex to rotate. Another, with a dense stricture, had uterine inertia in the second stage

of her third-term delivery and delivered uneventfully on three subsequent occasions. In the two other patients in whom the second stage lasted over 2 hours, there is no satisfactory explanation for the prolongation of the labor.

Intrapartum and post-partum complications were largely incidental. The instance of compound presentation eventuated in spontaneous evolution, Case 2 in Stephenson's¹³ report. The one maternal death resulted from spontaneous rupture of the uterus.

Febrile puerperia were observed in eighteen instances, or 37 per cent, as compared with 24 per cent in the control group. Two patients suffered severe puerperal pelvic infection. In one, this followed multiple unsterile vaginal examinations done elsewhere. In the other, no satisfactory explanation was found. However, since she developed a pelvic mass post partum, it is conceivable that she suffered an unrecognized rupture of the rectum outside the peritoneum into the soft tissues of the pelvis. There is no proof for this conjecture.

There was no impairment of bowel function in the puerperium as compared with the patients' function previously or with the control series.

Sterilization was performed in seven instances, four by tubal operation and three by hysterectomy; four accompanied cesarean section.

It should be mentioned that of the fourteen patients in whom a Frei or similar test was performed, thirteen were positive reactors.

The fetuses ranged in weight from 750 to over 4,000 grams, distributed similarly to those in the control group. Neonatal deaths occurred in two fetuses, 750 and 1,600 grams respectively in weight. There were five stillbirths, two in the same syphilitic mother. One stillbirth occurred in the instance of spontaneous evolution. Another was attributable to difficult breech delivery in a primigravida with contracted pelvis, Case 4. The fifth was associated with the maternal death due to ruptured uterus, Case 10.

More detailed information concerning these 48 labors is presented in Table IV.

Discussion

Rectal stricture may be the result of lymphopathia venereum, syphilis, tuberculosis, and other rarer causes. For all practical purposes, lymphopathia venereum has been accepted as the common cause of the dense scarring which reduces the lumen of the rectum, thickens its wall, and tends to immobilize the soft tissues of the pelvis. Further, in many instances, the infection spreads to involve the rectovaginal septum, scarring it and occasionally resulting in fistula formation.

Estimation of the importance of stricture as a cause of dystocia depends on careful examination and description not only of the caliber of the stricture but also of the status of the rectovaginal septum, of the location of the stricture, of the consistency of the scar tissue and of its extent in the connective tissue of the pelvis. A dense, pin-point stricture which is above the pouch of Douglas and unassociated with the pelvic scarring can hardly cause dystocia, and a soft, early stricture is also likely to be benign. A widely patent stricture densely fixed in the pelvis and involved in its retroperitoneal portion is a for-

TABLE IV. FORTY-EIGHT LABORS IN THE PRESENCE OF RECTAL STRICTURE OBSERVED AT THE JOHNS HOPKINS HOSPITAL

PATIENT YEAR	AGE	PARITY	DURATION OF LABOR		TYPE OF DELIVERY	FETAL WEIGHT	PUERPERIUM	COMMENTS
			SEC- OND STAGE	TOTAL				
1a. B. H. 1935	23	1-0-1-0-1	20	7-55	Vertex spontaneous	2,970	Afebrile	Severe rectal stricture.
1b. B. H. 1937	25	2-1-1-0-2	7	24-00	Vertex spontaneous	2,860	Afebrile	
1c. B. H. 1939	27	3-2-1-0-3	60	4-25	Vertex spontaneous	3,060	Afebrile	
1d. B. H. 1942	30	4-3-1-0-4	43	6-09	Vertex spontaneous	2,860	One-day fever	Post-partum tubal sterilization because of multiparity in the presence of slowly progressing stricture.
2. N. J. 1914	26	1-1-0-0-1	?	26-00	Spontaneous evolu- tion, compound presentation	2,500	Febrile	Stillborn. Note that the relatively large mass of a fetus undergoing spontaneous evolution passed through the birth canal evidently without rupturing the rectum.
3a. L. H. 1933	18	0	?	16-55	Vertex spontaneous	2,260	One-day fever	Severe stricture.
3b. L. H. 1935	20	1-0-1-0-1	10	4-20	Vertex spontaneous	1,425	Febrile	High fever on first post-partum day, per- sisting for two weeks. Mass in pelvis with birth canal apparently normal and intrauterine culture sterile. No satisfac- tory diagnosis. Eventual recovery.
3c. L. H. 1938	22	2-0-2-0-1	60	16-35	Vertex spontaneous	2,680	Endometritis	
3d. L. H. 1942	26	3-1-2-0-2	2	20-40	Vertex spontaneous	750	Afebrile	Fetus died on fourth day.
4a. M. W. 1920	25	4-0-4-0-0	55	9-00	Breech extraction	2,900	Afebrile	C.D. 10.5 cm. Stillborn. Another example of a large fetal mass passing through the birth canal uneventfully. Severe stricture.
4b. M. W. 1923	28	5-1-4-0-0	170	13-10	Vertex spontaneous	2,380	Afebrile	

5. C.C. 1942	25	1-0-0-1-0	172	38-16	Operative low forceps	3,370	Afebrile	Colostomy. Severe pre-eclampsia. Vertex failed to rotate, and, because of stretching of rectovaginal septum noted at delivery, delivered by forceps in transverse.
6. O. H. 1940	27	1-1-0-0-0	85	28-28	Operative low forceps	2,310	Afebrile	Previous abdominoperineal operation for ablation of rectum and colostomy. Uterine inertia in labor treated by pituitrin stimulation and forceps delivery. Post-partum tubal sterilization. Severe stricture.
7a. V. T. 1934	19	1-0-0-1-0	?	16-30	Breech extraction	2,470	One-day fever	
7b. V. T. 1938	23	2-0-1-1-1	-	-	Low cervical cesarean	3,145	Endometritis	Development of multiple perineal and rectovaginal fistulas and dense fixation of rectum and perirectal tissues necessitated delivery by cesarean section. Tubal sterilization.
8. M. N. 1942	31	0	-	-	Low cervical cesarean	2,570	Afebrile	Severe rectal stricture. Precolostomy established at section.
9. S. O. 1938	36	1-1-0-0-1	-	-	Classical cesarean	2,180	Endometritis	Severe urinary tract infection, chronic bronchitis and partial intestinal obstruction late in pregnancy which failed to respond to therapy necessitated cesarean section. Colostomy established and tubal sterilization at same operation. Rectovaginal fistula.
10. H. F. 1914	32	4-4-0-0-4	?	19-00	Vertex spontaneous	3,630	Mortality	Severe rectal stricture. Found at home lying on floor following precipitate delivery accompanied by severe pain. Placenta readily expressed. Patient left in pain but in good condition. Found later having bled 700 c.c., in deep shock. Transferred to hospital but died before treatment, in 3 hours. Autopsy revealed lower uterine segment rupture. Fetus stillborn.
11a. E. S. 1912	28	3-2-1-0-0	50	4-55	Vertex spontaneous	?	Afebrile	Stillborn syphilitic premature, no data on stricture.

TABLE IV—CONT'D

PATIENT, YEAR	AGE	PARITY	DURATION OF LABOR		TYPE OF DELIVERY	FETAL WEIGHT	PUERPERIUM	COMMENTS
			SEC- OND	TOTAL				
11b. E. S. 1913	29	4-2-0-0	?	20-00	Vertex spontaneous	1,600	Afebrile	Fetus died on seventh day.
11c. E. S. 1915	31	5-2-3-0-0	?	1-30	Spontaneous	920	Afebrile	Stillborn.
12. F. V. 1916	32	1-0-0-1-0	9	30-19	Vertex spontaneous	2,320	Afebrile	Post-partum hemorrhage 1,100 c.c.; marked rectal stricture.
13a. I. K. 1923	28	4-2-0-2-0	290	10-00	Operative midforceps	3,250	Endometritis	Uterine inertia in second stage; gonococcal endometritis; dense rectal stricture.
13b. I. K. 1925	29	6-3-0-3-1	?	7-44	Vertex spontaneous	3,800	Afebrile	
13c. I. K. 1927	32	7-4-0-3-2	15	8-30	Vertex spontaneous	3,300	Afebrile	Unclassified toxemia.
13d. I. K. 1933	36	10-5-0-5-3	29	12-30	Vertex spontaneous	2,920	Afebrile	Hysterectomy for repeated toxemia.
14a. A. L. 1923	36	4-4-0-0-3	30	12-34	Vertex spontaneous	3,520	Afebrile	Slight rectal stricture; elephantiasis, both legs.
14b. A. L. 1925	38	5-5-0-0-4	?	16-45	Vertex spontaneous	2,100	Afebrile	
14c. A. L. 1926	39	6-5-1-0-5	45	5-00	Vertex spontaneous	3,630	Afebrile	
14d. A. L. 1929	42	7-6-1-0-6	5	?	Vertex spontaneous	3,025	Afebrile	Probably rapid labor.
15. Q. J. 1924	31	0	56	27-56	Vertex spontaneous	3,380	Endometritis	Dense stricture with repeated dilatations.
16. J. H. 1926	30	0	?	21-46	Breech extraction	2,425	Endometritis	No data on stricture.
17. L. M. 1928	19	2-2-0-0-2	?	17-04	Vertex spontaneous	2,500	One-day fever	Dense stricture; subsequent salpingectomy for P.I.D.
18. L. A. 1929	19	0	?	5-40	Vertex spontaneous	3,070	Afebrile	Dense stricture.

19. F. B. 1929	27	1-1-0-0-0	-	-	Radical cesarean	3,665	Febrile	C.D. 10.5; craniotomy in previous labor; cervical atresia at term; dense rectal stricture.
20. M. M. 1934	29	4-3-1-0-3	?	25-20	Version and extrac-tion	2,250	Afebrile	Placenta previa; induced labor with Voorhees bag; version and extraction through incompletely dilated cervix; slight stricture.
21. M. H. 1934	22	3-2-0-1-2	20	12-50	Vertex spontaneous	3,365	Afebrile	Dense stricture with repeated dilatations.
22a. C. S. 1935	28	2-1-1-0-1	17	18-18	Vertex spontaneous	3,170	One-day fever	Dense stricture.
22b. C. S. 1942	35	5-2-1-2-2	31	8-25	Vertex spontaneous	2,800	Afebrile	
23. Q. B. 1938	24	0	40	8-42	Vertex spontaneous	2,750	One-day fever	No data on stricture.
24. M. M. 1939	23	3-2-0-1-2	?	5-30	Vertex spontaneous	3,030	One-day fever	Slight stricture; mastitis.
25. N. G. 1941	31	2-1-0-1-0	5	13-45	Vertex spontaneous	2,160	Afebrile	Dense stricture; rectovaginal fistula; pre-eclampsia.
26. E. H. 1942	26	1-0-0-1-0	?	14-34	Operative low forceps	2,570	Afebrile	Slight stricture; intrapartum pre-eclampsia.
27. M. W. 1942	39	3-2-0-1-2	-	-	Radical cesarean	2,980	Febrile	Very dense stricture involving rectovaginal septum.
28. E. F. 1942	18	0	55	15-00	Vertex spontaneous	2,820	Afebrile	Early slight stricture.
29. T. B. 1942	19	0	320	12-35	Vertex spontaneous	2,870	Afebrile	Slight stricture involving rectovaginal septum; ruptured Bartholin abscess at delivery.
30. S. M. 1942	20	1-0-1-0-1	14	4-38	Vertex spontaneous	4,120	Afebrile	Stricture of variable extent; slight at delivery.
31. G. B.	39	2-2-0-0-2	145	34-15	Operative low forceps	3,240	Endometritis	Slight stricture; dystocia due to kyphoscoliosis, asynclitism and maternal exhaustion.

Note: Duration of second stage is recorded in minutes. Duration of total labor is recorded in hours and minutes. Fetal weight is recorded in grams.

Parity as recorded in this table includes all pregnancies. Parity as referred to in the body of this report excludes abortions not observed at the Johns Hopkins Hospital. A patient with no previous term or premature deliveries is considered an essential primipara.

midable obstacle despite its patency. When this last condition exists, pelvic delivery may be possible only if some tearing occurs. The most dramatic form of this tearing, and one which, at the moment, provides the only recognizable clinical syndrome, is rupture of the rectum into the peritoneal cavity.

Of course, it is not possible to rule out the chance that the rectum may rupture within the pelvic floor, or that the necessary additional space may be provided by tears in the connective tissue without involving any hollow viscus. When the scarring is low and involves the rectovaginal septum, perineal laceration may also occur. When the scarring is high, episiotomy or perineal tear can only slightly release the tension created by higher scar tissue, and, under these circumstances, the obstruction may be such that the uterus may rupture.

As has been discussed above, thirty labors in the presence of rectal stricture are recorded in the literature, with a total of seven deaths, a mortality of 23 per cent.

It must be emphasized that the majority of reports are concerned with isolated maternal fatalities. Only one extensive series of cases is to be found, that of Kassebohm and Schreiber from Harlem Hospital in New York, including eighteen labors with two maternal deaths. The apparent high mortality rate in labor which appears in the literature is therefore clearly the result of a high degree of selection of the available data.

The cause of death in five cases was made clear by autopsy in four and operation in one (Cases 1, 2, 4, 21 and 30, Table I). In another, examination of the birth canal showed it to be intact and the early post-partum death must therefore be attributed to rupture of the rectum (Case 24, Table I). Information about the last case is too meager to allow any conclusions (Case 3, Table I). There are therefore five cases of rupture of the rectum recorded in seventy-eight labors associated with rectal stricture, forty-eight of these being added by this paper. The fact that the incidence of rupture of the rectum in the series of forty-eight labors at the Johns Hopkins hospital is zero and that the literature is highly selective makes it seem likely that the rate heretofore reported is excessive.

Two cases of ruptured uterus have occurred (Case 21, Table I; Case 10, Table IV). Anderson's case was associated with version and extraction and the etiology of the rupture is therefore uncertain. The one case of ruptured uterus in our series did not occur under direct observation and accordingly is also of uncertain etiology. In a search for further evidence as to the possible etiologic relation of rectal stricture to ruptured uterus, all cases of ruptured uterus at the Johns Hopkins hospital were reviewed and no further instance of rectal stricture found.

The therapeutic recommendations of the reports in the literature are therapeutic abortion, early gastrointestinal surgery, cesarean section or pelvic delivery with wide episiotomy, and routine sterilization.

The major objection to these proposed solutions is that they provide for no individualization of the treatment of the patient. On this ground alone, as will be discussed later, abortion, section and sterilization cannot be proposed for every patient with a rectal stricture.

Intestinal surgery is most appropriately reserved for treatment of the complications of the stricture itself. Moreover, colostomy in no way alters the scar tissue in the pelvis, which is responsible for dystocia.

Nor does wide or bilateral episiotomy solve the problem, since it does not create space where the tension which ruptures the rectum probably exerts its full force. Once the vertex has reached the outlet, its greatest diameter has passed the area of maximum cicatrization. Episiotomy, while it is undoubtedly of value in lessening the soft-tissue tension at delivery, is therefore best employed as the individual case demands, and for the customary indications.

The policy of the department of obstetrics of the Johns Hopkins hospital in the handling of patients with rectal stricture has been in the process of formation since the recent reports of fatality due to rupture of the rectum. Its basis has been a consideration of each patient in terms of the extent of the rectal pathology.

Involvement of the pouch of Douglas by the pelvic scarring, regardless of the caliber of the stricture or the state of the rectovaginal septum, is felt to carry with it the greatest risk of rupture of the rectum, and cesarean section is advised. Scarring of the rectovaginal septum and the presence of rectovaginal fistula appear less grave, and the decision in regard to cesarean section depends on parity, the state of the pelvis, the history of previous bowel obstruction and other potential causes of dystocia. Stricture of the rectum in which all scarring is limited to the rectal wall, and especially where the stricture is high and out of the pelvis, is not thought to be a bar to pelvic delivery.

Each patient is seen in a consultation clinic with the chief of the obstetric service as early as possible in pregnancy and again at about thirty-two weeks, for re-examination. An active process may advance considerably during pregnancy so that the choice of means of delivery is altered. Contrariwise, the scarring may be softened to such a degree that pelvic delivery is felt to be without hazard, even though cesarean section was previously decided upon.

Existence of a colostomy generally acts as a deterrent from cesarean section because of the potential difficulties of any transperitoneal procedure after colostomy.

Pelvic delivery in the presence of enterostomy seems to be a safe procedure on the basis of the limited experience in this clinic. In addition to the two patients with colostomy described above, one patient,

not included in this series, has been observed with an ileostomy performed for ulcerative colitis. She was delivered of her first pregnancy by elective low forceps after 13 hours of labor. Whether the occurrence of uterine inertia in both patients with colostomy and rectal stricture was more than coincidence cannot be determined now. In these three cases the function of the enterostomies was in no wise disturbed by pelvic delivery; the three infants all did well, and the mothers' puerperia were uneventful.

If a patient suffers obstruction near term which fails to respond to nonoperative treatment, cesarean section is combined with colostomy. If cesarean section is performed electively, it is felt advisable to establish a precolostomy at the same time. In this operation, a segment of the descending colon is brought through a left lower quadrant gridiron incision in the fascia and muscle and sutured so that it lies directly under the skin, without interrupting its continuity. Should obstruction occur at a later date, a functioning colostomy may be established by a simple incision through the skin and subjacent bowel wall without entering the peritoneal cavity. The precolostomy may be performed by a consulting surgeon, adds little to the operating time and, since it is a closed and aseptic procedure, does not add to postoperative morbidity.

The patients chosen for pelvic delivery require special attention. Spontaneous delivery is preferred on the ground that the natural forces of labor are less likely to tear the scarred tissues than is forceps delivery.

Prolongation of the second stage of labor while the mother and fetus remain in good condition is regarded as a smaller risk than operative interference. Heavy sedation in labor is to be avoided, since it may mask the distinctive clinical picture of rupture of the rectum, the earliest symptom of which may be severe lower abdominal pain.

It has been proposed that these patients be prepared for pelvic delivery with a bowel antiseptic such as succinylsulfathiazole to minimize the danger of peritonitis following rupture of the rectum. However, once rupture occurs, the safety of the patient inevitably depends on the immediate recognition of the clinical picture and immediate operation.

It is felt that pelvic deliveries in the presence of rectal stricture should be limited in number, especially if the disease is progressing. For this reason post-partum tubal sterilization may be offered to the patient.

Stricture of the rectum is an unusual and grave complication of labor, and one not likely to decrease in incidence in the visible future. It is therefore incumbent upon obstetricians, particularly in the large clinics serving Negro patients, to bend every effort toward the early accumulation of information and the evolution of a program for the safe management of pregnancy complicated by this condition.

Summary

Forty-eight labors in the presence of rectal stricture observed by the department of obstetrics of the Johns Hopkins hospital are reported. The incidence of grave complications is found to be lower than that previously reported in the literature. One maternal death due to rupture of the uterus apparently unconnected with rectal stricture occurred in this series, and there was no obvious instance of rupture of the rectum.

The program evolved by this department for the management of these patients in labor depends primarily on a consideration of the location and extent of the rectal scarring in the individual patient. Cesarean section is reserved for those patients with extensive involvement of the pouch of Douglas or the pelvic soft parts. Colostomy or precolostomy may be performed in association with cesarean section if necessary. Pre-existing colostomy is not felt to be a bar to pelvic delivery. Spontaneous delivery and avoidance of sedation are advised if pelvic delivery is decided upon, and the patient must be watched closely post partum for the appearance of signs and symptoms of rupture of the rectum.

References

1. Dorsett, L.: *Surg., Gynec. and Obst.* 30: 283, 1920.
2. Kassebohm, F. A., and Schreiber, M. J.: *AM. J. OBST. & GYNEC.* 31: 674, 1936.
3. Gaines, C., and MacDowell, J.: *J. A. M. A.* 107: 964, 1936.
4. Kassebohm, F. A., and Schreiber, M. J.: *New York State J. Med.* 37: 484, 1937.
5. Anderson, R. E.: *Memphis M. J.* 13: 184, 1938.
6. Michelson, I. D., et al.: *AM. J. OBST. & GYNEC.* 35: 322, 1938.
7. Vignes, H.: *Rev. franç. de gynéc. et d'obstet.* 34: 215, 1939.
8. Vignes, H.: *Maladies des Femmes Enceintes* 3: 66, 1: 296, Paris, 1940.
9. Vignes, H.: *Bull. acad. de méd. Paris* 23: 730, 1940.
10. Fagarasano, I.: *Rev. de chir. Bucuresti* 43: 553, 1940.
11. Pollard, W. E., and Hellendahl, H.: *AM. J. OBST. & GYNEC.* 44: 317, 1942.
12. Peckham, C. H.: Personal communication.
13. Stephenson, H.: *Bull. Johns Hopkins Hosp.* 26: 331, 1915.

Leon, J., Gairolì, R. L., and Ledesma, D. A.: *Fetal Attitude in the Uterine Cavity*, *Arch. Clin. obst. y ginec., "Eliseo Cantón"* 1: 750, 1942.

The roentgen ray studies of the authors have shown them that the fetus in utero does not normally assume the ball-like attitude as is generally believed. In fact, many bizarre attitudes were observed. In polyhydramnios the upper and lower extremities are found distant from the trunk as in a swimmer's attitude. If, in addition to this attitude, there is hyperextension of the cervical spinal column, one should suspect polyhydramnion and hydrops of the fetus. The authors believe that occasionally x-ray studies may reveal an abnormal attitude which would indicate induction of labor or embryotomy, thereby avoiding an unnecessary operation such as cesarean section.

J. P. GREENHILL.

ECTOPIC PREGNANCY

A Review of 75 Consecutive Cases as Compared With a Previous Review of 82 Cases*

DAVID M. FARELL, M.D., AND LEWIS C. SCHEFFEY, M.D.,
PHILADELPHIA, PA.

(From the Department of Gynecology, Jefferson Medical College Hospital)

IN NOVEMBER, 1931, Scheffey, Stimson, and Morgan,¹ in a report given before the Obstetrical Society of Philadelphia, presented an analysis of 82 consecutive cases of ectopic pregnancy as observed in the gynecologic ward service at Jefferson Medical College Hospital between September 1, 1921 and September 1, 1931. In the eleven-year period from September 1, 1931 to September 1, 1942, there occurred 75 additional ectopic pregnancies on the same service. In this report, we shall analyze the salient features of these additional cases, and correlate our findings with the previous series.

Incidence, Age, and Reproductive History

The seventy-five ectopic pregnancies reviewed in this report occurred among 5,579 admissions, representing an incidence of 1.3 per cent, as compared with the previous incidence of 2.1 per cent. Both Farrar² and Urdan³ reported an incidence of 1.5 per cent among gynecologic patients.

The ages of these patients ranged from 18 to 44 years. The largest number of patients, forty-four (58 per cent), were in their third decade (21 to 30 years), a percentage identical with that noted in the first series. This finding agrees closely with that of other observers: Johnson,⁴ 57 per cent; Ware and Wenn,⁵ 56 per cent; Schauffler,⁶ 50 per cent.

TABLE I. AGE INCIDENCE

Under 21 years	4	5 per cent
21 to 30 years	44	58 per cent
31 to 40 years	24	32 per cent
Over 40 years	3	4 per cent

The reproductive history of these patients is pertinent. Twelve patients (16 per cent), had never conceived before. Thirteen patients (17 per cent), had conceived but the pregnancies had not continued to term, twelve having terminated in abortions with one resulting in an ectopic pregnancy. Thus, significantly, 33 per cent of the patients had not conceived previously, or having conceived did not carry any pregnancies to term. In the previous series, a similar condition was found in 29 per cent. This indicates a relative infertility in the patients reviewed in this study.

Etiology

Many reasons have been ascribed as causative of extrauterine pregnancy. Novak⁷ divides these into two main groups: one, factors which

*Read at a meeting of the Obstetrical Society of Philadelphia, April 1, 1943.

delay or prevent the passage of the fertilized ovum to the uterine cavity; two, factors which increase the receptiveness of the tubal mucosa for implantation of the fertilized ovum.

The most frequent factor that delays the passage of the fertilized ovum is an obstruction produced by inflammatory changes in the tube itself. This theory was advanced by Lawson Tait⁸ in 1888. Hecker,⁹ as early as 1859, called attention to the fact that peritoneal adhesions, by compressing the lumen of the tube, may interfere with the passage of the ovum. Conceivably, pelvic enlargements may cause a constriction of the tube because of external pressure.

In thirty patients (40 per cent), gross evidence of chronic inflammatory change in the uninvolved tube was found at operation. Hence, it is probable that like changes may have been present in a similar percentage of the tubes in which the ectopic pregnancy occurred. This incidence corresponds exactly to the figure in the previous survey. In one case an acute salpingitis coexisted with the ectopic pregnancy. Fibromyoma uteri were present in four patients, and in one instance, the fibromyoma surrounded the tube at the cornua.

Twenty patients (26 per cent), approximately the same figure noted in our former study, had had previous abdominal operations. Five in the former, and three in the second series, had been operated upon for ectopic pregnancy (5 per cent of 157 cases). Thus the possibility of postoperative adhesions involving the tubes must be borne in mind as an etiologic factor in the occurrence of extrauterine pregnancy.

Novak⁷ explains further why the fertilized ovum does not lodge in the tubes normally. First, the trophoblast is not developed until the fertilized ovum reaches the uterine cavity; second, the tubal mucosa is not designed for implantation. He believes that the retardation of the progress of the ovum gives time for the development of the trophoblast while the fertilized ovum is still in the tube. Evidence in support of the theory that receptivity of the tubal mucosa to the fertilized ovum has been increased is found in the fact that a definite decidual reaction was found in twenty-seven (36 per cent), of the removed specimens examined histologically. This phase was not considered in the previous study.

Symptomatology

The two most common complaints were abdominal pain and vaginal bleeding. Every patient experienced pain at some time. The date of onset of abdominal pain in relation to the last menstrual period was as follows: In twelve patients (16 per cent), between 2 and 4 weeks after the last regular period; in thirty-three patients (44 per cent), between 4 and 6 weeks; in twenty-six patients (34 per cent), between 6 and 8 weeks; and in four patients (5 per cent), between 8 and 12 weeks.

Forty-nine patients (65 per cent), complained of severe and persistent pain. The remainder described their pain as being "colicky" or intermittent. In ten instances, the pain was referred to the bladder or rectum. Upper abdominal pain was mentioned only once. As a rule, the discomfort was generalized in distribution, only one-third of the patients localizing the pain in one or the other lower quadrant. Pain was also a constant symptom in the previous series; in 56 per cent of the patients, it was severe or lancinating and in the remainder relatively moderate.

The menstrual history prior to the occurrence of the present illness was normal in sixty-seven patients (90 per cent), and irregular in periodicity in only eight patients. This finding indicates that in the majority of patients there is no association between the normalcy of the menstrual function and the occurrence of an ectopic pregnancy, an observation similar to that noted in our previous survey.

Vaginal bleeding of an irregular nature subsequent to the last previous regular menstrual period was present in seventy patients (93 per cent). Five patients gave no history of any external bleeding since the previous regular period.

Sampson¹⁰ established the endometrium as the source of the external bleeding in ectopic pregnancy, and believes that the bleeding is initiated by the separation of the decidua, following the death of the embryo. This is a popular point of view, the physiology of which has been painstakingly explained by Jones and Brewer.¹¹ In nineteen patients (25 per cent), the bleeding occurred before the next expected menstrual period and in fifty-one patients (68 per cent), at the time of or after the expected menses.

In analyzing the time of bleeding in relation to the findings at operation, one is forcibly impressed by the following observation: Whereas twelve (63 per cent), of the patients with tubal rupture bled before the expected period, only seven (13 per cent), of those with tubal abortion or intact ectopic pregnancy bled before the expected menses. Thus, in this series, we found that the majority of the tubal ruptures had external vaginal bleeding before the expected menses and that the majority of the tubal abortions and intact ectopic pregnancies gave a history of a "missed" period. (Table II.)

TABLE II. EXTERNAL BLEEDING IN RELATION TO OPERATIVE FINDINGS

RELATIONSHIP OF BLEEDING TO MENSES	TUBAL RUPTURE	TUBAL ABORTION	INTACT ECTOPIC
Prior	12	5	2
During or after	4	33	14
No bleeding	3	2	0
	19	40	16

Syncope, usually mentioned as one of the cardinal symptoms, occurred in thirteen patients (17 per cent). Eight of these patients had ruptured tubal pregnancies. In the previous series, syncope was present in 27 per cent of the patients.

The concomitant signs of pregnancy were relatively unreliable. Only five patients had any symptoms referable to the breasts while eleven complained of nausea.

Physical Findings

Physical examination revealed abdominal tenderness either general or localized in seventy patients (93 per cent). In the previous series, the figure was 85 per cent. Rigidity was found in fourteen (19 per cent). In four patients, abdominal masses could be palpated, and abdominal distension was noted in ten (13 per cent).

Pelvic examination was carried out in all but two of the patients. The most constant sign was adnexal tenderness which was present in fifty-eight (77 per cent). Definite pelvic masses were palpable in forty-four (59 per cent). A softened cervix was found 18 times, and a

palpably enlarged uterus in 22 instances (29 per cent). These findings correspond closely to those of the previous analysis.

Repeated blood pressure readings were valuable in cases where progressive internal hemorrhage was suspected. In the majority of patients the blood pressure was well maintained. Only sixteen patients (21 per cent), had systolic pressures below 100 mm. of mercury; nine of these had ruptured tubes.

The pulse rate was significant in cases of tubal rupture; of the seventeen patients having a pulse rate over 110, eleven had tubal ruptures. The patients' temperature upon admission was of little diagnostic value, the majority ranging between 98 and 100 degrees. Seven had temperatures over 100, and all of these were found to have a considerable amount of free blood in the peritoneal cavity. Two patients who were admitted in shock because of tubal rupture had temperatures below 98 degrees.

Blood Studies

The blood findings assume more significance when reviewed in relation to operative findings. Of the five patients having red cell counts under 2.5 million, four had ruptured tubes. Only one patient with a tubal abortion and none with an intact tubal pregnancy had a red cell count under 2.5 million. Hemoglobin readings generally corresponded to the red cell values. Evidence of hemoconcentration was not noted.

Leucocytosis appears with intra-abdominal hemorrhage and is in response to peritoneal irritation. In this series, white cell counts over 15,000 were found in fifteen patients with tubal rupture and in three with tubal abortions. Counts under 15,000 were found in thirty-seven patients with tubal abortion and in all with intact ectopic pregnancy. Thus very high leucocyte counts were relatively more frequent with rupture than with tubal abortions. Where the pregnancy was intact, the leucocyte count was nearly always under 10,000. These findings correspond to those reported by Ricci,¹² and are similar to those found in the earlier review.

The blood sedimentation rate was increased in cases where free blood was found in the pelvis. The most rapid sedimentation rates (Cutler Method) occurred in the patients having tubal ruptures and tubal abortions. In the intact ectopic pregnancies, only one showed a rate greater than 20 mm. in 2 hours. This interpretation is in accord with previous observations, and leads to the conclusion that the sedimentation rate is a fairly accurate indicator of intra-abdominal hemorrhage. Its greatest value is in differentiating pelvic inflammatory disease from an intact tubal pregnancy; when inflammatory changes following rupture or abortion have occurred, its differential significance is correspondingly decreased. (Table III.)

Accessory Diagnostic Procedures

Accessory diagnostic procedures performed included the biologic test for pregnancy and peritoneoscopy. Endometrial curettage was carried out frequently, but chiefly as a matter of record.

Biologic tests may give either positive or negative results depending upon whether or not the trophoblast is still functionally active in the production of chorionic gonadotropic hormones. With death of the fetus and degeneration of the chorionic villi, the elaboration of hormones ceases and the test becomes negative.

TABLE III. BLOOD STUDIES

HEMOGLOBIN	OVER 80 PER CENT	55 TO 80 PER CENT	LESS THAN 55 PER CENT
Tubal rupture	2	9	8
Tubal abortion	12	27	1
Intact ectopic	5	11	0
	19 (25 per cent)	47 (63 per cent)	9 (12 per cent)
RED BLOOD CELLS	OVER 4 MILLION	2.5 TO 4.0 MILLION	LESS THAN 2.5 MILLION
Tubal rupture	2	13	4
Tubal abortion	12	27	1
Intact ectopic	5	11	0
	19 (25 per cent)	51 (67 per cent)	5 (7 per cent)
WHITE BLOOD CELLS	5 TO 10 THOUSAND	10 TO 15 THOUSAND	OVER 15 THOUSAND
Tubal rupture	2	2	15
Tubal abortion	23	14	3
Intact ectopic	14	2	0
	39 (52 per cent)	18 (24 per cent)	18 (24 per cent)
BLOOD SEDIMENTATION	5 TO 12 MM	12 TO 20 MM	OVER 20 MM
Tubal rupture	1	4	11
Tubal abortion	4	11	22
Intact ectopic	4	4	1
	9 (12 per cent)	19 (25 per cent)	34 (45 per cent)

The Friedman test was carried out in thirty-one patients; twenty-two (71 per cent), were positive and nine (29 per cent), were negative. In the twenty-two positive tests, the Friedman test was of distinct value, for in nine of these patients the diagnosis was not definitely made until the positive test was obtained. The presumptive diagnoses in these nine patients were pelvic inflammatory disease, four cases; ureteral stricture, one case; infected abortion, three cases; pelvic abscess, one case. In the remaining thirteen cases, the diagnosis of ectopic pregnancy was made before the results were known, and the tests were therefore confirmatory.

The preoperative diagnoses in nine patients having negative tests were ectopic pregnancy, five patients; chronic pelvic inflammatory disease, two patients; pelvic abscess, one patient; fibromyoma uteri, one patient. The operative findings in these patients showed five "old" tubal pregnancies with much organized blood clot in the pelvis; three fairly recent tubal abortions, and one patient had an intact tubal pregnancy.

The Friedman test was certainly of value in a group of twenty-nine patients in whom ectopic pregnancy was suspected. Seventeen of them responded negatively, and the final diagnoses were: pelvic inflammatory disease, thirteen; functional uterine bleeding, 2; incomplete abortion, two. The remaining twelve patients, had positive tests. Of these, ten had intrauterine pregnancies, while in two instances, the test was false; for the patients had pelvic inflammatory disease, proved in one case by operation and in the other by clinical means. In the earlier series only two biologic tests were performed.

Curettage was performed prior to laparotomy in twenty-two patients, showing a decidual reaction 9 times; an interval endometrium,

9 times; a premenstrual endometrium, 2 times, a postmenstrual endometrium, 1 time; a local endometrial hyperplasia, 1 time. The presence of a nondecidual reaction in thirteen patients may be explained on the basis of the death of the embryo, whereby the decidua had been cast off, after which various phases of the endometrial picture returned. These findings are in accord with the recent observations of Siddal and Jarvis¹³ who state that "a uterine curettage is a valuable diagnostic aid" and that "the finding of intact decidua without chorionic villi is strong presumptive evidence of extra-uterine pregnancy." "The absence of decidual reaction is not reliable evidence against ectopic pregnancy."

Eleven patients in this series had both curettage and a Friedman test performed. In seven of these, the Friedman test was positive, and there was a decidual reaction in the endometrium as well. In two patients, the biologic test was negative, and there was no decidual reaction present. In two other patients in whom the biologic test was negative, a decidual reaction was present, thus demonstrating that the Friedman test was false in these instances. These latter results are at variance with the recent statement of Goldblatt and Schwartz¹⁴ who concluded in their studies correlating the Friedman test with the endometrial picture that "no patient with uterine decidua had a negative Friedman test, and no patient with a negative Friedman test had uterine decidua at the time of curettage."

Peritoneoscopy was a useful diagnostic aid in five patients. The finding of free blood in the peritoneal cavity and the visualization of an adnexal mass confirmed the diagnosis once and operation immediately followed the procedure. In the remaining four patients in whom ectopic pregnancy was suspected, the procedure revealed cystic ovaries in two instances, pelvic inflammatory disease in another, and an intra-uterine pregnancy in the fourth case.

Posterior colpotomy was not performed for diagnosis in any of our cases.

Diagnosis

Correct preoperative diagnoses of ectopic pregnancy were confirmed at operation in 54 of the 75 patients in the series (72 per cent). The diagnoses were incorrect in the case of 21 remaining patients (28 per cent), in whom the following conditions were diagnosed preoperatively: pelvic inflammatory disease, 5; incomplete abortion, 4; intrauterine pregnancy, 3; retroversion of the uterus, 3; ovarian cysts, 3; pelvic abscess, 1; ureteral stricture and ovarian cyst, 1; intrauterine and intestinal obstruction, 1.

During the same eleven-year period, 13 patients diagnosed as ectopic pregnancies, were found upon laparotomy to have: pelvic inflammatory disease, 4; ruptured Graafian follicle, 2; tuboovarian abscess, 1; myoma and intrauterine pregnancy, 1; dermoid cyst, and intrauterine pregnancy, 1; ovarian cyst and intrauterine pregnancy, 1; ovarian cyst and twisted pedicle, 1; ruptured appendix, 1; no pathology, 1.

The most frequent error encountered in diagnosis was due to the confusion that exists between pelvic inflammatory disease and ectopic pregnancy. Ovarian cysts, accompanying an intrauterine pregnancy, and ruptured Graafian follicle cysts occurred next in frequency. The 1921 to 1931 series showed a correct preoperative diagnosis in 78 per cent of the patients. Here, too, pelvic inflammatory disease was most frequently mistaken for ectopic pregnancy.

In patients operated upon immediately or within 24 hours after admission to the ward, the symptoms and signs were so clear-cut and urgent that no difficulty was encountered in making a diagnosis. Of the 75 patients here reported, 38 were operated upon within 24 hours and the diagnosis of ectopic pregnancy was verified in each. Of the 8 patients operated upon within 24 to 72 hours, the preoperative diagnosis of ectopic pregnancy was made in six. Of the 29 patients operated upon after 72 hours, 10 were correctly diagnosed preoperatively. That the greatest number of incorrect diagnosis would be in the delayed cases, is understandable. Here the findings were not clear and operation was delayed as a matter of judgment. (Table IV.)

TABLE IV. DIAGNOSIS

DIAGNOSIS	OPERATED UPON WITHIN 24 HOURS		OPERATED UPON WITH- IN 24 TO 72 HOURS		OPERATED UPON AFTER 72 HOURS	
	CORRECT	INCORRECT	CORRECT	INCORRECT	CORRECT	INCORRECT
Tubal rupture	15	0	0	0	1	3
Tubal abortion	20	0	2	2	5	11
Intact ectopic	3	0	4	0	4	5

It is of interest to note that 107 patients were sent to the ward service with a presumptive diagnosis of ectopic pregnancy. After sufficient observation, the attending staff made a diagnosis of ectopic pregnancy in 67 of them, and they were all operated upon. Fifty-four (80 per cent), were found to have extrauterine pregnancies. Thus of all patients sent to the ward with an admitting diagnosis of ectopic pregnancy, 50 per cent were eventually proved to have this condition.

Operative Findings

The operative findings in this series were as follows: tubal rupture, 19 patients (25 per cent); tubal abortion, 40 patients (53 per cent); intact tubal pregnancy, 15 patients (20 per cent); ovarian pregnancy, 1 patient (1 per cent).

This represents a ratio of 2 tubal abortions to 1 tubal rupture.

In comparing these findings with the previous analysis, considerable variance is found—a reversal of this proportion, viz., 3 tubal ruptures to 1 tubal abortion. The previous report showed: tubal ruptures, 66 per cent; tubal abortions, 19 per cent; intact tubal pregnancy, 14 per cent. This difference may be explained by more careful recording of the lesions observed in the present series, and throws doubt on the accuracy of the former estimate.

The ectopic pregnancy occurred on the right side in 40 patients, on the left side in 35 patients, a finding of no particular significance, as in the previous study.

At laparotomy, free blood was found in the peritoneal cavity of 63 patients, and in 16 instances the amount was large. In 7 no free blood was noted. As previously noted, gross chronic inflammatory changes were found in the uninvolved tube in 40 per cent of both series.

An associated uterine abnormality was found 20 times (26 per cent), as follows: fibromyoma, 4 cases; retroflexio-version, 8; endometriosis, 1; uterus adherent to tubes, 6; uterus adherent to old cesarian scar, 1. In the previous analysis, the uterine abnormalities amounted to 8.5 per cent.

Operative Treatment

Whenever possible, conservatism was practiced. For brevity, the operative procedures are outlined in Table V.

TABLE V. OPERATIVE TREATMENT

Unilateral Salpingectomy	31
Curettage and Unilateral Salpingectomy	8
Curettage and Salpingo-Oophorectomy	3
Salpingo-Oophorectomy	13
Drainage and Curettage, Cauterization of Cervix and Salpingo-Oophorectomy	2
Drainage and Curettage, Cauterization of Cervix and Salpingectomy	1
Salpingo-Oophorectomy and Appendectomy	3
Salpingectomy and Appendectomy	3
Drainage and Curettage, Colporrhaphy, Salpingectomy and Appendectomy	1
Drainage and Curettage, Trachelectomy, Colporrhaphy and Salpingectomy	1
Salpingectomy, Appendectomy and Tubal Ligation	1
Curettage, Cauterization of Cervix and Bilateral Salpingectomy	1
Curettage, Bilateral Salpingo-Oophorectomy	2
Drainage and Curettage, Bilateral Salpingo-Oophorectomy and Hysterectomy	2
Bilateral Salpingo-Oophorectomy and Hysterectomy	2
Curettage, Removal of Fetus From Cul-De-Sac and Suspension of Uterus	1

Sixty-six of the 75 patients in this series were not rendered sterile. In 27 of these, the reproductive history was followed to date. Only five conceived; 2 had miscarriages; 2 had a second ectopic; 1 carried the pregnancy to term.

Morbidity and Mortality

Six patients (8 per cent), had a complicated postoperative course. The nature of these complications and the postoperative residence is as follows: one, infected incision, 61 days; one, cystitis, 29 days; two, atelectasis, 18 days and 16 days; one, pneumonia, 28 days; one, phlebitis, 36 days.

One death occurred in this series, a mortality rate of 1.3 per cent. This patient was operated upon immediately after admission to the ward following a delay of several hours in the receiving ward. Death occurred on the fourth postoperative day, despite all attempts to combat initial shock and hemorrhage. The autopsy findings were fibromyoma uteri, congestion of the spleen, and parenchymatous degeneration of both kidneys.

In the previous series there were 4 deaths, a total mortality of 4.8 per cent. Two patients were moribund on admission and died before operation could be performed. There were 2 postoperative deaths, and operative mortality of 2.5 per cent. The combined mortality for the two series includes 5 deaths (3.2 per cent), and an operative mortality of 3 deaths (1.9 per cent).

Summary

A series of 75 consecutive cases of ectopic pregnancy was analyzed and compared with a previous review of 82 cases. The incidence

among gynecologic admissions was 1.3 per cent in this series and 1.6 per cent in the combined review. In both studies the majority of patients were in the third decade of life.

One-third of the patients had either not conceived previously, or, having conceived, did not carry the pregnancy to term.

Gross evidence of chronic inflammatory change in the uninvolved tube was found in 40 per cent of the patients, and 26 per cent had had previous abdominal operations. This high incidence of inflammatory disease and the role that postoperative adhesions may play in causing mechanical hindrance, are important etiologic factors in the production of an ectopic gestation.

Abdominal pain was experienced by all patients and the onset was most frequently observed from 2 to 4 weeks after the last previous period.

Some form of irregularity of the current menstrual cycle was noted in 93 per cent of the patients. The majority of those experiencing tubal rupture reported external vaginal bleeding before the expected menses, while the majority with tubal abortions and intact ectopic pregnancies gave a history of a "missed period."

Concomitant signs of pregnancy were infrequent.

Pelvic masses were palpable in 59 per cent of the patients.

In intact tubal pregnancy, blood studies are comparatively normal. As tubal abortion or tubal rupture occurs, the red cell count decreases, leucocytosis increases, and the sedimentation rate becomes more rapid.

The biologic test can be a distinct aid in diagnosis, but only when supported by other signs and symptoms of ectopic pregnancy.

In nine of the 22 patients in whom a uterine curettage was done, a decidual reaction of the endometrium was observed.

Peritoneoscopy is a rational procedure and has much to offer in the confusing case.

The proportion of tubal abortion to tubal rupture was 2 to 1; this is a reversal of the proportion recorded in the previous review.

Correct diagnoses were made in 76 per cent of the combined series. Pelvic inflammatory disease was the lesion most frequently confused with ectopic pregnancy.

The total mortality rate in the combined series amounted to 3.2 per cent, while the operative mortality rate was 1.9 per cent. For the first series, the operative mortality rate was 2.5 per cent, and for the present series 1.3 per cent.

The deaths in both series emphasize the danger of delayed operation in tubal pregnancy. Prompt operation, and the use of blood transfusion and plasma to combat hemorrhage and shock, are efficacious means for decreasing the mortality rate.

References

1. Scheffey, L. C., Morgan, T. C., and Stimson, C. M.: *AM. J. OBST. & GYNEC.* **24**: 103, 1932.
2. Farrar, L. K. P.: *Amer. J. Obst.* **79**: 229, 1919.
3. Urdan, B. E.: *AM. J. OBST. & GYNEC.* **20**: 355, 1930.
4. Johnson, W. O.: *AM. J. OBST. & GYNEC.* **43**: 437, 1942.
5. Ware, H. H., and Winn, W. C.: *AM. J. OBST. & GYNEC.* **42**: 33, 1941.
6. Schauffer, G. C., and Wynia, F. O.: *AM. J. OBST. & GYNEC.* **42**: 786, 1941.
7. Novak, E.: *Gynecological and Obstetrical Pathology*, Philadelphia, 1940, W. B. Saunders Company.
8. Tait, L.: *Diseases of Women and Abdominal Surgery*, 1889.
9. Hecker, V.: *Monatschr. f. Geburtsh.* **63**: 1859.
10. Sampson, J. A.: *Tr. Am. Gynec. Soc.* **38**: 121, 1913.
11. Jones, B. A., and Brewer, J. I.: *AM. J. OBST. & GYNEC.* **38**: 839, 1939.
12. Ricci, J.: *AM. J. OBST. & GYNEC.* **22**: 857, 1931.
13. Siddall, R. S., and Jarvis, C.: *Surg., Gynec. & Obst.* **65**: 820, 1937.
14. Goldblatt, M. E., and Schwartz, H. A.: *AM. J. OBST. & GYNEC.* **40**: 233, 1940.

1831 DELANCEY STREET
255 S. 17TH STREET

THE INTRINSIC RISK OF BREECH DELIVERY

PENDLETON TOMPKINS, M.D., PHILADELPHIA, PA.

(From the Philadelphia Lying-in and Maternity Department of The Pennsylvania Hospital)

OBSTETRIC statistics invariably show a high fetal mortality for the "breech baby"; therefore, it is usually assumed that breech delivery is extremely dangerous. The fetal hazard probably has been exaggerated in the minds of obstetricians by failure to distinguish between the risks of *breech presentation* and the risks of *breech delivery*. Breech presentation occurs often in premature labors and in cases of gross fetal anomalies and it is not infrequently complicated by placenta previa or prolapsed cord. These factors constitute hazards which should be distinguished from the intrinsic risk of the delivery. It is the purpose of this study to discover, if possible, the fetal mortality attendant upon uncomplicated breech delivery.

Because breech presentations occur not much more often than four times in 100 deliveries, it is unlikely that a single obstetrician will be able to submit a series of personally attended cases large enough to have statistic significance. Therefore, deductions must be based upon a series of cases delivered by a group of obstetricians. Many clinics have presented data on large numbers of breech deliveries, but these large series usually include deliveries made by interns, residents, courtesy members of the staff and others of undetermined experience and competence. For these reasons the massed data previously published do not indicate what fetal mortality may be expected in uncomplicated breech deliveries under ideal conditions. This study is an analysis of a series of cases which, from the standpoint of obstetric management, approaches ideal conditions and from the standpoint of the statistician is otherwise unselected.

Since there is no satisfactory definition of an "expert obstetrician," we have arbitrarily decided to regard certification by the American Board of Obstetrics and Gynecology as acceptable evidence of competence. In the 1942 edition of the *Directory of Medical Specialists* (Columbia Press) 17 members of the Staff of the Pennsylvania Hospital (Philadelphia Lying-in) are listed as obstetricians. From some 1400 records of breech presentation in the Pennsylvania Hospital we selected *every case personally delivered* by these 17 obstetricians after their certification by the Board. Cases delivered by others under supervision by these men, or in consultation with them, are not included. (Table I.) This somewhat artificial standard has several disadvantages: it greatly reduces the number of cases available for study, it takes no account of results obtained by some older and several younger staff members of unquestioned ability, and, in several instances, it places personal responsibility upon a chief or junior attending obstetrician who was called to the delivery room in an emergency for which he was not accountable. On the other hand, such a completely arbitrary standard renders the data suitable for comparison.

Two hundred and eleven cases of breech presentation personally delivered by these 17 obstetricians are the basis of this study. One hundred and eighty babies were delivered vaginally; internal podalic versions were excluded from the series. Thirty-one patients, all with single pregnancies, were delivered by cesarean section. The number seems large (14 per cent of the breech cases) but is explained in Table II. Our special interest was directed to the group in which cesarean section was employed because of "disproportion," for we

TABLE I. SHOWING THE NUMBER OF STAFF MEMBERS OF THE PHILADELPHIA LYING-IN HOSPITAL CERTIFIED BY THE AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY, THE YEAR OF CERTIFICATION, AND THE RESPECTIVE NUMBERS OF BREECH DELIVERIES BY THEM SINCE CERTIFICATION

DOC- TOR	YEAR CERTI- FIED	BEFORE											TOTAL
		1933	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	
1	1930	0	1	0	4	4	1	0	2	2	5	5	24
2	1930	0	0	0	0	0	0	0	0	0	0	0	0
3	1931	0	0	0	0	0	0	1	0	0	0	0	1
4	1931	0	3	2	3	8	7	6	6	6	2	3	46
5	1931	0	1	0	0	0	0	0	0	0	0	0	1
6	1934	-	-	0	0	2	2	0	0	0	5	0	9
7	1936	-	-	-	-	6	10	6	7	8	9	14	60
8	1937	-	-	-	-	-	0	2	3	0	3	0	8
9	1937	-	-	-	-	-	0	0	1	1	1	0	3
10	1937	-	-	-	-	-	2	0	4	2	4	0	12
11	1938	-	-	-	-	-	-	7	5	5	4	0	21
12	1939	-	-	-	-	-	-	-	0	0	0	0	0
13	1939	-	-	-	-	-	-	-	1	0	5	3	9
14	1940	-	-	-	-	-	-	-	-	3	3	6	12
15	1940	-	-	-	-	-	-	-	-	0	0	0	0
16	1940	-	-	-	-	-	-	-	-	2	1	1	4
17	1941	-	-	-	-	-	-	-	-	-	1	0	1
Total breech deliveries		0	5	2	7	20	22	22	29	29	43	32	211

felt that these were the patients whose babies might have been lost if vaginal delivery had been attempted. Although it is often impossible to determine from an old history whether cesarean section was or was not indicated, Table III provides justification for the procedure in most instances. In 15 of the 17 cases of disproportion x-ray studies of the pelvis contributed to the decision on operation.

Of the 211 infants delivered, 189 left the hospital alive and well; 22 died. The causes of death are shown in Table IV. Table V gives the fetal mortality for the series. Premature and malformed fetuses are excluded for obvious reasons as is the case of death of the fetus from maternal toxemia four days ante partum. Since the presence of placenta previa introduces additional risk to the baby, such cases are excluded. It may be argued that twins, being small, do not run as

TABLE II. INDICATIONS FOR 31 CESAREAN SECTIONS IN A SERIES OF 211 BREECH PRESENTATIONS

Pelvic disproportion (see Table III)	17
Previous cesarean section	6
Placenta previa	3
Severe toxemia of pregnancy at 28 weeks	1*
Breech misdiagnosed as face presentation	1
Myoma uteri complicating breech presentation	1
Nullipara, aged 41, overdue one week	1
Dense vulvoperineal scars (lymphopathia venereum ?)	1
Total	31

*Only fetal death in this group. Baby died four days before delivery.

TABLE III. INDICATIONS FOR CESAREAN SECTION IN 17 CASES OF BREECH PRESENTATIONS DESCRIBED AS "DISPROPORTION"

HISTORY NUMBER	AGE	PARITY	BABY'S WEIGHT	TRIAL OF LABOR	X-RAY OF PELVIS	CON-TRACTED PELVIS	REMARKS
27841	29	0	2982 Gm.	no	yes	yes	Android pelvis, overdue 1 wk.
23715	30	0	3098 Gm.	35 hr.	yes	yes	
23957	35	0	3204 Gm.	no	yes	yes	
17480	26	0	3320 Gm.	3 hr.	yes	yes	
30001	27	0	3349 Gm.	no	yes	yes	Android pelvis
27171	32	0	3465 Gm.	no	yes	yes	
23776	24	0	3470 Gm.	no	yes	yes	Android pelvis
12526	29	0	3628 Gm.	no	yes	no	Overdue 1 wk.
13136	25	0	3715 Gm.	no	no	yes	
30715	24	0	3716 Gm.	13 hr.	yes	no	Overdue 1 wk.
28286	21	0	4005 Gm.	8 hr.	yes	yes	Android pelvis
23102	33	1	2866 Gm.	no	yes	yes	Asymmetric android pelvis
23994	28	1	3127 Gm.	no	yes	yes	
27046	32	1	3156 Gm.	no	no	no	Previous breech delivery with fracture of fetal femur and clavicle
29337	34	1	3523 Gm.	no	yes	yes	Android pelvis, mitral stenosis, overdue 1 wk.
25030	33	1	3628 Gm.	no	yes	no	Previous breech delivery, baby died
17353	40	1	3710 Gm.	no	yes	no	Maternal congenital dislocation of hip with marked pelvic inclination

great a risk in breech delivery as single larger babies; or it may be said that in the case of the second twin the way has been smoothed. Twins are therefore omitted on the ground that risks typical of breech delivery are not encountered. Finally, cesarean sections are excluded since these are not truly breech births. We are left with 146 uncom-

TABLE IV. CAUSE OF 22 FETAL DEATHS IN 211 BREECH PRESENTATIONS

Lines 1 through 10 Table V	DEATHS NOT ATTRIBUTABLE TO DELIVERY	18
	Prematurity (babies less than 1,500 Gm.)	13
	Gross abnormalities: 2 babies each with hydrocephalus and spina bifida	2
	Severe toxemia of pregnancy, fetal death 4 days before delivery. No labor. Cesarean section	1
	Erythroblastosis fetalis, death of a "second" twin after 28 hours	1
	Placenta previa with severe hemorrhage	1
Lines 11 through 15 Table V	DEATHS PROBABLY NOT ATTRIBUTABLE TO MANAGEMENT OF DELIVERY	2
	Prematurity (weight 1,525 Gm.). Private patient	1
	Cord around neck, fetal distress 2 hours before delivery, death one hour before delivery. Private patient	1
	DEATHS DIRECTLY ATTRIBUTABLE TO MANAGEMENT OF DELIVERY	2
	Unrecognized disproportion: 2 wks. overdue, 31 hour labor, fetal death 21 hours before delivery, impacted breech, baby weighed 3,250 Gm. Ward patient	1
	Unrecognized disproportion: contracted pelvis, 12 hour labor, difficult delivery, baby weighed 3,110 Gm. Autopsy showed cerebral hemorrhages. Ward patient	1

TABLE V. FETAL MORTALITY IN 211 CASES OF BREECH PRESENTATION

LINE	CASES	FETAL DEATHS	FETAL MORTALITY
1 Breech presentations	211	22	10.4%
2 Babies less than 1,500 Gm.	15	13	—
3 —Remainder	196	9	4.6%
4 Gross abnormalities	2	2	—
5 —Remainder	194	7	3.6%
6 Severe toxemia of pregnancy, fetal death 4 days before labor or delivery	1	1	—
7 —Remainder	193	6	3.1%
8 Cases of placenta previa	6	1	—
9 —Remainder	187	5	2.6%
10 Breech presentation of second twin (one death from erythroblastosis fetalis)	8	1	—
11 —Remainder	179	4	2.2%
12 Breech presentation of first twin	6	0	—
13 —Remainder	173	4	2.3%
14 Cesarean section excluding 3 cesareans for placenta previa (included in line 8 above) and one for toxemia (included in line 6 above)	27	0	—
15 Breech presentations delivered vaginally excluding babies under 1,500 Gm., gross fetal abnormalities, one fetal death before the onset of labor, cases of placenta previa and twins	146*	4	2.7%

*The 146 cases shown in line 15 include 7 ward patients. Among these 7, two fetal deaths occurred. If ward patients are subtracted, the figures are 139 deliveries with 2 fetal deaths, or a fetal mortality of 1.4 per cent for private patients.

The low mortality rates are as much a credit to the pediatric as to the obstetric staff.

plicated breech deliveries; in these, four babies died. The fetal mortality rate of 2.7 per cent for this group represents, as nearly as can be determined, the intrinsic risk of breech delivery in this hospital. Even so, as Table IV makes clear, two of these four deaths could have been prevented, and, in retrospect, should have been prevented by cesarean section. There was no maternal mortality in the series.

In the management of breech presentation the following policies are recommended:

1. An x-ray study of the maternal pelvis should be made in nulliparous patients.
2. The membranes should seldom be ruptured artificially because of the danger of prolapse of the cord and the increased risk if cesarean section is subsequently necessary.
3. The patient should be fully anesthetized before delivery.
4. Decomposition of the breech is to be undertaken only in exceptional cases.
5. Traction is not to be used until the breech has passed the introitus.
6. In primiparas a generous episiotomy is advisable.
7. After delivery of the umbilicus the back should be turned uppermost to prevent posterior rotation of the occiput, and constant pressure should be maintained on the fetal head from above to prevent extension.
8. Forceps, preferably Piper's after-coming head forceps, should be utilized in all but the easiest cases.
9. Since there is no certain means of determining disproportion, consultation should be sought early in every doubtful case.

Summary

All breech deliveries attended by "certified" obstetricians at Pennsylvania Hospital have been studied to determine the risk inherent in breech delivery. After exclusion of babies of less than 1,500 Gm., cases of gross fetal abnormality, fetal death before the onset of labor, placenta previa, twin pregnancies, and babies delivered by cesarean section, there remain of the 211 breech presentations, 146 uncomplicated breech deliveries. Four of these 146 babies died, a mortality rate of 2.7 per cent. It therefore appears that breech delivery, in experienced hands, carries a lower fetal mortality rate than has heretofore been supposed.

The data permit a corollary statement: Further lowering of the gross fetal mortality rate in breech deliveries in this hospital depends not so much upon improving the technique of delivery as upon solving a much larger obstetrical problem, the prevention of premature labor.

GESTATIONAL NEURONITIS, A DEFICIENCY DISEASE*

A. CHARLES POSNER, M.D., F.A.C.S., AND EMANUEL L. HECHT, M.D.,
NEW YORK, N. Y.

(From the Obstetric Service of the Bronx Hospital)

THE tendency of the obstetrician, or of any specialist, to regard his patients from the narrowed viewpoint of his particular field and to divorce from his specialty, whether by choice or by ignorance, well-recognized precepts of present-day internal medicine, is a deplorable one. In our discussion of this case of gestational neuronitis, we shall attempt to consider this failing in detail.

The term "cardiovascular collapse" is neither an adequate nor a scientific explanation of an infrequent, but all too common, cause of maternal morbidity and mortality. Neither the obstetrician nor the consulting internist need resort to complex, high sounding nomenclature when it is possible to define more precisely what the patient is suffering from, once an inquiry has been made into the etiological factors at work.

Case Report

C. M., a 25-year-old housewife, para 0, gravida 1, was admitted to the Bronx Hospital on October 10, 1940, six weeks before term, complaining of persistent vomiting of seven weeks' duration. Her family and past history were of no significance. Her diet during pregnancy had been well balanced, containing adequate amounts of fresh fruits, vegetables, meat and milk.

In the sixth month of gestation the patient began to suffer from marked nausea and tendency toward vomiting. The attacks of vomiting increased in frequency; during the seven weeks just previous to admission she had difficulty in retaining any nourishment. In the two weeks prior to admission her weight dropped from 161 to 151 pounds. She became relatively weak and could not perform her daily duties. There was some numbness of the lower extremities, but no pain, hyperesthesia or burning of the soles of the feet. The blood pressure rose slightly in the seventh month of pregnancy, from 120/70 to 134/80. The ankles swelled slightly. The urine showed a trace of albumin, but no sugar.

On admission, the patient presented the picture of a well-developed, fairly well-nourished female, not dyspneic, orthopneic or cyanotic. Her mentality was clear. The skin was dry, and there was some scaliness on the dorsum of the hands and feet and on the lower legs. The extraocular muscles were normal; the corneas were clear and the conjunctivas uninjected; examination of both fundi failed to reveal any abnormality. The nasal, buccal and pharyngeal mucous membranes appeared to be slightly thickened; they were dull red in color and scaly in certain areas. The dry, grayish pink tongue was covered with scales and was cracked in places. There was a slight acetone odor to the patient's breath. The respiratory rate was 22 per minute.

*Read before the Section of Obstetrics and Gynecology of the New York Academy of Medicine on October 28, 1941.

The point of maximum cardiac impulse was in the fifth intercostal space, 0.5 centimeter inside the midclavicular line. The sounds were of good quality at both apex and base, with no abnormal pulsations or thrills. A soft systolic blow, not transmitted, was heard at the pulmonary area. The ventricular and pulse rates were each 86 per minute and regular. Blood pressure was 120/80. Temperature was 100.6° F. Abdominal examination revealed a seven and one-half months' gestation. The fetal heart was heard in the right lower quadrant; the rate was 140, and the sounds were regular and of good quality. Rectal examination showed a hard, thick, closed cervix, with the head unengaged and the membranes intact. Neurologic examination was negative except for slight weakness and hypersensitivity. There was some tenderness, but no pain, in the leg muscles. Leg extension and leg raising were good. The superficial and deep reflexes were equal and active.

Laboratory data on admission were as follows: red blood cells 5,500,000, hemoglobin 90 per cent (Sahli), white blood cells 11,700, with a normal differential. Urinalysis was negative except for a four-plus acetone. Carbon dioxide combining power was 30.5 c.e. per hundred cubic centimeters. Except for slightly elevated uric acid (6.3 milligrams per hundred cubic centimeters), the blood chemistry was within normal limits.

In view of the severe ketosis, as indicated by the low carbon dioxide combining power, acetoneuria and clinical evidence of dehydration, the patient was treated with intravenous fluids (3,000 c.e. of 5 per cent glucose in normal saline daily) and small doses of insulin. She responded well; acetone disappeared from the urine and the vomiting stopped. At this time the patient was started on 10 milligrams of vitamin B₁ and 50 milligrams of nicotinic acid daily.

Thirty-six hours after admission, the patient's pulse suddenly rose from 80 to 150 per minute and remained at that level. When the heart was examined, the point of maximal impulse was found to be in the fifth interspace, 0.5 centimeter outside the midclavicular line. The rhythm was regular, but the sounds of poor quality. The patient began to experience severe dyspnea; respirations increased from 22 to 40 per minute and were shallow in character. There were occasional medium moist râles at the bases of both lungs. No edema was present. The blood pressure had dropped slightly, from 120/80 to 102/78. The urine contained one-plus albumin, 4.5 per cent sugar and three-plus acetone. The carbon dioxide combining power was 24.9 volumes per cent. The blood sugar was within normal limits; blood chlorides were 460 milligrams per hundred cubic centimeters. The patient reacted well to the previous treatment of 5 per cent glucose in saline, intravenously, and small doses of insulin.

In spite of the amelioration of the signs of ketosis, the patient's pulse and respirations persisted at their very rapid rate. On the second and third days after the onset of the episode of respiratory and circulatory failure, the patient developed edema involving the face, lower extremities and back. At the same time, a marked disproportion between fluid intake and output was noticed. In the forty-eight-hour period preceding the appearance of the edema, the patient received 7,000 c.e. of fluid and excreted 1,100 c.e. The specific gravity of the urine ranged between 1,020 and 1,028. Blood chemistry, except for a slight elevation in uric acid (6.5 milligrams), remained normal.

At this time the patient presented evidence of clouding of consciousness and disorientation as to time and place. She became mentally confused and her speech was less clear. The tachycardia was more pronounced, the ventricular rate surpassing 150 per minute. Numbness of the feet developed. The cranial nerves were intact, and there was no nystagmus. The superficial and deep reflexes were equal and apparently undiminished.

The electrocardiogram gave witness to myocardial damage. There was marked sinus tachycardia (140 beats per minute). The PR interval was .18 and the QRS .08. T_2 and T_3 were inverted, and there was a deep Q_3 . Attempts to lower the pulse rate with digitalis were ineffective.

The fourth day after the beginning of the circulatory and respiratory crisis, the patient's blood pressure dropped to 70/30 and the fetal heart was no longer heard. In view of the progressive circulatory and respiratory failure, it was deemed advisable to remove the fetus. After two unsuccessful Watson inductions, the membranes were ruptured. When the patient had been in labor for five hours and the head had rested on the perineum for forty minutes with no progress, a slightly macerated stillborn infant (dead twenty-four hours), weighing six pounds, was delivered by low Elliott forceps; this was five days after the sudden onset of circulatory and respiratory distress.

For the first fifty hours after delivery, the patient's condition remained critical. The respirations were 35 to 40 per minute, the ventricular rate 130 to 140 per minute, and the blood pressure 80/60. Twelve hours after delivery the temperature rose to 102° F., but returned to normal in twenty-four hours.

On the third day post partum the patient improved noticeably. At this time she was receiving 40 milligrams of vitamin B_1 a day and nicotinic acid to the amount of 100 milligrams daily, the smaller initial doses having been increased immediately following delivery. The pulse and respiratory rates and the blood pressure returned to normal levels. Marked diuresis, with a urine of low specific gravity, was noted. By this time neurologic examination furnished evidence of severe polyneuritis. The eyegrounds showed pale retinas; the disc margins, however, were distinct. Corneal and pharyngeal reflexes were absent, as were the biceps, triceps and abdominal reflexes. Knee and ankle jerks could not be elicited. No response was obtained to stimulation of the soles of the feet. There was marked weakness of the extremities, most pronounced in the distal portions. The lower extremities were definitely atrophied. The patient could not raise her legs from the bed, nor could she sit up alone. She gave variable and inconstant responses to cotton and pinprick. There appeared to be unmistakable hypesthesia and hypo-algesia in the arms and legs, more marked distally. Deep muscle and tendon pain was increased.

No evidence of myocardial damage was found electrocardiographically nine days after delivery. PR was .18, QRS was .08, T 's in all leads were upright, and the deep Q_3 had disappeared.

During the patient's entire hospital stay, from October 10 to December 10, 1940, vitamin B complex was administered to replenish the loss resulting from persistent vomiting. In view of the pronounced manifestations of polyneuritis, however, huge doses of thiamin chloride, nicotinic acid and brewer's yeast were pushed, with gradual, but progressive, improvement.

In January, 1941, three months post partum, the patient still exhibited some weakness of the legs, particularly of the extensor muscles of the thighs. The marked wasting which was present on her discharge from the hospital was no longer evident. She walked with only slight difficulty. The biceps and triceps reflexes had returned, but the knee and ankle jerks were still absent. All dysesthesias of the arms and legs had disappeared. There was no abnormality of the cardiovascular system.

At the present writing, seven months post partum, practically normal muscular function has returned and the patient is able to walk well. The knee and ankle jerks can again be elicited. Recovery from a disease in which all three manifestations of vitamin B₁ deficiency were observed can now be said to be complete.

Discussion

Many divergent suggestions have been offered to explain the etiology of neuronitis of pregnancy. In 1854 Churchill¹ advanced anemia, uremia, rheumatism and hysteria as possible causes of the paralysis. Jaccoud² in 1864 gave the highly theoretical explanation that the paralysis is due to exhaustion of the nervous system by prolonged and continued excitement of the cord, whose impulses are transmitted by the uterine nerves, thus exhausting the excitability of that particular segment of the cord and closing the avenues by which motor impulses pass. A little later Jolly³ ascribed the paralysis to hysteria. Möbius⁴ in 1887 was one of the first to suggest a theory of autointoxication; he believed some "morbid condition" of the blood of the pregnant woman to be the causative factor. Tuilant,⁵ noticing that severe vomiting precedes the neuritis, suggested that lack of nourishment is the principal cause. Polyneuritis resulting from starvation has been reported by Schlesinger⁶ and others, but histopathologic studies have been largely neglected. The reader is referred also to the papers of Whitfield⁷ and other writers.⁸⁻¹⁰

Polyneuritis of pregnancy (gestational neuronitis), alcoholic polyneuritis, diabetic, biliary and gastrogenous polyneuritides, postinfectious polyneuritis, Korsakow's syndrome and other similarly misleading names have concealed the true diagnosis of vitamin B₁ deficiency clinically and pathologically identical with the Oriental disease. These polyneuritides differ only in the particular mechanism by which the deficiency is brought about. Cowgill¹¹ has shown that the vitamin B₁ requirement of man is directly proportional to body weight, caloric intake and metabolism.

In pregnancy, the nausea that is so often experienced restricts the patient's diet to concentrated carbohydrates low in vitamin B₁ content. Then, because of vomiting, she fails to retain all that she ingests. Furthermore, her metabolic rate, and with it her vitamin B requirement, are elevated by gestation; it is possible also that the processes of assimilation are reduced. If the vomiting becomes persistent, modern scientific therapy of so-called "pernicious vomiting" tends to increase the severity of the avitaminosis. With forced fluids, a temporary relief of the anorexia and anhydremia may result, but the removal of the vitamins by the consequent diuresis may be actually detrimental in that the vitamin B complex is washed from an already depleted body.

The clinical and pathologic manifestations of vitamin B₁ deficiency in pregnancy are the same as those resulting from some of the causes

mentioned above. The disease may make its appearance in either one or a mixture of three recognized types:

1. The "neuritic" form, also known as "dry" beriberi, which involves the nervous system primarily.
2. The "wet" form, or "edematous" variety, which presents the clinical picture of diffuse edema, dependent and nondependent.
3. The "cardiac" type, which manifests itself by disturbances of the cardiovascular system.

The neurologic findings may be confined to the peripheral nerves or may reflect involvement of the spinal cord. Optic neuritis has also been reported. Korsakow,¹² who is credited with calling the attention of the medical profession to certain mental changes accompanying the polyneuritis of alcoholism, reported with Serbski similar mental changes in polyneuritis of pregnancy.

Anatomic examination of cases of gestational neuronitis brought to autopsy has revealed definite degenerative changes in the peripheral nerves. In the cases reported by Dustin,¹³ Lindemann¹⁴ and Job,¹⁵ degenerative changes were found also in the anterior horn cells of the spinal cord. These changes were most marked in the lumbar region and consisted of loss of Nissl substance, swellings of the cells, eccentricity of the nuclei and occasional cell necrosis. Similar changes were demonstrated in the bodies examined post mortem by Berkwitz and Lufkin.¹⁶ Petechial hemorrhages of the brain and spinal cord were also observed; these, however, are not to be considered characteristic, as such changes are often observed in cases of severe dehydration. Cline,¹⁷ Mills¹⁸ and Patten¹⁹ have also reported on multiple neuritis of pregnancy.

As a result of recent observations and investigations, the relation of vitamin B₁ deficiency to heart disease has become firmly established. Aalsmeer and Wenckebach,²⁰ in their studies of beriberi in Java, repeatedly noticed the occurrence of heart failure in the disease. On post-mortem examination of many of their cases, they recorded edema and "hydropic degeneration" of the myocardium. In 1933, Hanns and Warter²¹ described four cases of myocardial disease associated with polyneuritis. In the same year, Campbell and Allison²² reported in Ireland a series of eight cases of polyneuritis in which the symptoms of cardiovascular dysfunction were more prominent than the neuritic signs; they explained the cardiac disturbances on an infective basis. The relationship to nutritional deficiency, however, is too obvious to be ignored. Scott and Herrmann²³ cited cardiac manifestations of beriberi among the rice workers of Louisiana. Riesman and Davidson²⁴ described a case of beriberi heart following severe voluntary dietary restrictions. In 1936, Weiss and Wilkins,²⁵ in reporting cases of "wet" beriberi with cardiovascular disturbances, stressed the relationship of the disease to vitamin B₁ deficiency; the administration of vitamin B was followed by marked improvement. Furthermore, Weiss and his co-workers^{26, 27} have reproduced cardiac disorders in animals fed a thiamin-deficient diet; these disturbances disappeared after the administration of thiamin chloride.

Jones and Sure²⁸ reported on a group of eighteen cases of cardiac insufficiency treated successfully with high vitamin B₁ concentrate. In the case of severe heart failure described by Hashimoto²⁹ in 1937, the intravenous administration of thiamin chloride brought rapid relief

from precordial distress, dyspnea and nausea. In 1938, Nylin³⁰ published his observations on cases of beriberi heart with severe failure; these showed prompt improvement following the administration of thiamin chloride. Yudkin³¹ in 1938 presented a case of beriberi with cardiac manifestations which responded to thiamin chloride therapy.

Dustin, Weyler and Roberts³² analyzed the electrocardiographic changes in cases in which there were histories of unbalanced diet and clinical evidence of vitamin B₁ deficiency. They noticed a rapid rate, increase in duration of the electric systole, tendency to low voltage, and flattening of the T waves in leads I, II and III. Defects in the electrocardiogram disappeared following treatment with thiamin chloride. Williams, Mason and Smith³³ demonstrated similar changes in the electrocardiograms of four young women who had followed diets deficient in vitamin B₁. Weiss, Haynes and Zoll²⁷ observed like electrocardiographic changes in vitamin B-deficient rats, where also disappearance of the defects followed dosage with vitamin B₁.

In the case reported here, all three manifestations of vitamin B₁ deficiency appeared, all secondary to prolonged, persistent vomiting in the last trimester of pregnancy. On the patient's admission to the hospital, mild signs of peripheral neuritis were observed. She was therefore given what was considered to be an ample amount of vitamin B in all forms. However, in view of the more serious complications of vitamin B₁ deficiency that subsequently developed, it would appear that the initial dosage was insufficient. In addition, it must be remembered that this patient was treated primarily for her "pernicious vomiting" with large amounts of intravenous fluids, which, by the consequent diuresis, probably further reduced her already depleted vitamin B stores.

The sudden increase in pulse rate together with the change in quality of the heart sounds, the fall in blood pressure and the grossly detectable enlargement of the heart associated with the changes in the electrocardiogram, reflect the damage sustained by the cardiovascular system as a result of vitamin B₁ deficiency. The suddenness with which cardiac failure can occur during the course of the disease has been described in several of the articles cited previously.²⁵⁻²⁷

The appearance of edema in the second and third days after the onset of circulatory failure, and the associated oliguria with highly concentrated urine, can categorically be described as the "wet" type of beriberi.

The marked increase in efficiency of the circulation, namely, the disappearance of the signs and symptoms of vasomotor collapse, the improvement in quality of the heart sounds and the disappearance of all defects in the electrocardiogram, in contrast to the lag in improvement of the neurologic disorders following intensive vitamin B therapy furnishes definite evidence of myocardial damage.

The diuresis which took place during the period of improvement, both of which succeeded the increase in dosage of vitamin B, is to be noted. A similar observation has been made by Jones and Bramwell.³⁴

The lack of parallelism between the rates of improvement in circulatory and nervous function is striking. Apparently the cardiac disturbances respond quickly and completely to intensive vitamin B therapy. In Hashimoto's²⁹ case, the clinical manifestations of both right and left ventricular failure improved dramatically after the in-

travenous administration of vitamin B₁ (thiamin chloride). Van Bogaert³⁵ in 1938 described the case of a young man who had developed cardiac failure as a result of alcoholic beriberi; the patient recovered rapidly when treated with thiamin chloride. In the experiments performed by Weiss and his associates,²⁵⁻²⁷ in which cardiac disturbances were induced in animals fed a thiamin-deficient diet, the disappearance of symptoms following the administration of thiamin chloride was prompt and rapid. Similar experiments were done by de Soldati,³⁶ who in addition demonstrated the swiftness with which defects in the electrocardiogram are remedied by the use of thiamin chloride in deficiency animals (dogs). Feil³⁷ and Keefer³⁸ also gave their attention to this problem.

The neuritic manifestations in the case reported herewith responded very slowly to vitamin B₁ therapy. The long interval that elapsed before practically normal function was restored is perhaps indicative of more extensive changes than those involving the peripheral nerves. It would not be assuming too much to state that some damage was sustained by the gray matter of the anterior horns, particularly in the lumbar region.

Summary

A case is reported in which all three manifestations of vitamin B₁ deficiency were observed, namely, the "neuritic," "cardiac" and "edematous" varieties, all secondary to prolonged, persistent vomiting in the last trimester of pregnancy. The dramatic response of the cardiac dysfunction to vitamin B₁ therapy, in contrast to the lagging improvement of the nervous disturbances, is to be noted. The literature on vitamin B deficiency is reviewed.

51 EAST NINETIETH STREET

References

1. Churchill, F.: *Dublin J. M. Sc.* 17: 257, 1854.
2. Jaccoud, S.: *Études de pathogénie et de sémiotique. Les paraplégies et l'ataxie du mouvement*, Paris, 1864, A. Delahaye.
3. Jolly, J.: *J. Neurol. Zentralbl.* 4: 305, 1885.
4. Möbius, P. J.: *München. med. Wehnschr.* 34: 153, 1887. *Ibid.*: *München. med. Wehnschr.* 37: 247, 1890.
5. Tuilant, A.: *De la névrite puerpérale. Thèse de duct.*, Paris, 1891.
6. Schlesinger, H.: *Wien. klin. Rundschau* 33: 236, 1919.
7. Whitfield, D. W.: *Lancet* 1: 627, 1899.
8. Wilson, K. M., and Garvey, P.: *AM. J. OBST. & GYNEC.* 23: 775, 1932.
9. Strauss, M. B., and McDonald, W. J.: *J. A. M. A.* 100: 1320, 1933.
10. Luikart, R.: *AM. J. OBST. & GYNEC.* 25: 810, 1933.
11. Cowgill, G. R.: *The Vitamin B Requirement of Man*, New Haven, 1934, Yale University Press.
12. Korsakow, S., and Serbski, W.: *Arch. f. Psychiat.* 23: 112, 1892.
13. Dustin, A. P.: *La polynévrite gravidique. Nouv. iconog. de la Salpêtrière* 22: 349, 1909.
14. Lindemann, W.: *Centralbl. f. allg. Path. u. path. Anat.* 3: 625, 1892.
15. Job, L.: *Ann. de gynéc. et d'obst. (ser. 2)* 8: 129, 1911.
16. Berkwitz, N. J., and Lufkin, N. H.: *Surg., Gynec. & Obst.* 54: 743, 1932.
17. Cline, C. A.: *M. Clin. North America* 8: 416, 1924.
18. Mills, A. E.: *M. J. Australia* 2: 331, 1919.
19. Patten, C. A.: *Arch. Neurol. & Psychiat.* 21: 721, 1929.
20. Aalsmeer, W. C., and Wennekebach, K. F.: *Wien. Arch. f. inn. Med.* 16: 193, 1929.
21. Hanns, A., and Warter, J.: *Arch. d. mal. du cœur* 26: 391, 1933.
22. Campbell, S. B. B., and Allison, R. S.: *Lancet* 2: 410, 1933.
23. Scott, L. C., and Herrmann, G. R.: *J. A. M. A.* 90: 2083, 1928.
24. Riesman, D., and Davidson, H. S.: *J. A. M. A.* 102: 2000, 1934.

25. Weiss, S., and Wilkins, R. W.: *Tr. A. Am. Physicians* 51: 341, 1936.
26. Taylor, F. H. L., Weiss, S., and Wilkins, R. W.: *J. Clin. Investigation* 16: 833, 1937.
27. Weiss, S., Haynes, F. W., and Zoll, P. M.: *Am. Heart J.* 15: 206, 1938.
28. Jones, W. A., and Sure, B.: *J. Lab. & Clin. Med.* 22: 991, 1937.
29. Hashimoto, H.: *Am. Heart J.* 13: 580, 1937.
30. Nylin, G.: *Nord. med. tidskr.* 15: 827, 1938.
31. Yudkin, J.: *Lancet* 2: 1347, 1938.
32. Dustin, C. C., Weyler, H., and Roberts, C. P.: *New England J. Med.* 220: 15, 1939.
33. Williams, R. D., Mason, H. L., and Smith, B. F.: *Proc. Staff Meet. Mayo Clinic* 14: 787, 1939.
34. Jones, A. M., and Bramwell, C.: *Brit. Heart J.* 1: 187, 1939.
35. Van Bogaert, A.: *Arch. d. mal du cœur* 31: 1195, 1938.
36. de Soldati, L.: *Rev. soc. argent. de biol.* 15: 142, 1939.
37. Feil, H.: *Am. Heart J.* 11: 173, 1936.
38. Keefer, C. S.: *Arch. Int. Med.* 14: 1, 1930.

THE EFFECT OF A SALT-POOR DIET ON THE LENGTH OF LABOR

DONALD M. SCHUITEMA, M.D.,* GRAND RAPIDS, MICH.

(*From the Salvation Army Home and Hospital*)

IN THE last decade there have appeared a number of reports in the literature stating that a salt-poor diet in the latter part of pregnancy results in a shorter labor and often in less severe labor pains. This observation was first noted by Hofstein and Petrequin in 1931, by Karpati, and several years later by Reeb and Israel. Two series of cases were reported in the United States in 1940 by Wadlow and by Pomerance and Daichman. All these workers agree on the effects of a salt-free diet in shortening labor.

In view of the apparent success of these investigators it was decided to place 50 patients on a rigidly controlled salt-poor diet and to use 50 others for control. Patients of the Salvation Army Home and Hospital in Grand Rapids, Michigan, were available for this study. Since the patients were institutionalized it was possible to supervise their diet. Separate food without salt was prepared for those on the salt-poor diet, and they ate at separate tables at which salt was not served. All patients on the salt-poor diet were volunteers. All cases studied were primipara. They came from similar environments and the same doctor gave prenatal care and delivered all patients in both groups in about the same period of time. The length of time for which patients were kept on a salt-poor diet ranged from four to nineteen weeks. In order to determine the extent of the salt-poor diet, chloride determinations were made weekly on 24-hour urine specimens.

Only the normal deliveries were used for the analysis of the results. All labors were of spontaneous onset. Most of the deliveries were by

*Captain, U. S. Army, in active service.

low forceps, only 15 per cent of the salt-poor group and 19 per cent of the control terminated spontaneously. Toxemias, of which there were five in the control and three in the salt-poor group, and breech extractions of which there were four in the control and two in the salt-poor group, were excluded.

The average weight gain in pregnancy is comparable in both groups. The control group gained 23.2 pounds, while the salt-poor group gained 21.4 pounds. The groups are also comparable with respect to age. The average age of the control is 18.2 while that of the salt-poor group is 19.2 years.

Sixty-five per cent of the control and 75 per cent of the salt-poor group were below 20 years of age. Since this comparability minimizes the effects of age on the duration of labor, it is interesting to note that the length of labor of the different age groups is quite constant in the salt-poor group and variable in the control. (Table I.)

TABLE I

AGE	SALT-POOR		CONTROL	
	NO. CASES	LENGTH OF LABOR—HOURS	NO. CASES	LENGTH OF LABOR—HOURS
14 to 16	7	8.1	9	8.5
17 to 19	25	7.7	22	10.7
20 to 22	10	7.5	7	9.0
23 to 25	4	7.5	3	4.9

It should be noted, however, that textbooks give the average duration of labor in primipara as 18 hours and in multipara as 12 hours. Adair, Dieckmann and co-workers in some 500 normal patients found the average duration to be 14.8 hours for primipara and 8.4 hours for multipara. Furthermore, Dieckmann and Brown found the average duration of labor in toxemic patients to be 16.3 hours for primipara and 9 hours for multipara. They did note that the labor in multiparous patients with edema was two hours less than those without edema. Many of the edematous patients had been on a salt-poor diet for days or even several weeks. It is obvious that the duration of normal labor in both primipara and multipara is decidedly less than the usual figures given in textbooks. Therefore, studies of the effect of a salt-poor diet must be compared with a control group, instead of data taken from textbooks.

The results and their statistical treatment are given in Table II.

TABLE II

	NO. CASES	MEAN HOURS	RANGE	ST. DEV.	ST. ERROR	SIGNIFICANCE RATIO
Salt-Poor	46	7.28	1-26	4.39	.65	1.50
Control	41	9.02	2-35	6.13	.96	

Although there is a difference of 1.74 hours in the length of labor between the control and the salt-poor group, the individual variations in the groups were such that this difference is not statistically sig-

nificant. Here again it may be noted from the differences in range and in standard deviation that the variations in the length of labor were much smaller in the salt-poor than in the control group.

For comparison the results from other papers on this subject are given in Table III. Only primiparous normal deliveries are included in the table.

TABLE III

AUTHOR	SALT-POOR		CONTROL	
	NO. CASES	LENGTH OF LABOR—HOURS	NO. CASES	LENGTH OF LABOR—HOURS
Hofstein & Petrequin	5	3.96*		
Reeb & Israel	10	4.03* (4.65)		
Reeb	56	5.25* (6.0)		
Pomerance & Daichman	51	9.9	33	22.9
Wadlow	34	6.58	100	13.08

*These figures indicate time of complete dilatation while figures in parentheses are calculated time of delivery.

The figure 22.9 hours for normal labor does not correspond with the usual observations and, of course, should not have been used for comparison with their treated group of patients. The differences in the length of labor between the control and the salt-poor groups shown in the above table are much greater than reported here. The length of labor of the salt-poor group agrees well with that given by Wadlow but the length of labor of the control group is much lower than either of the two reported in Table III. Wadlow does not state exactly how long his patients were restricted in salt intake, but the patients of Pomerance and Daichman were kept on a salt-poor diet for about six months. It is highly improbable that any of the patients maintained a salt-poor diet for six months, primarily because food is so unpalatable without salt, and secondly, because of the difficulties involved in obtaining such a diet. Seventy per cent of the patients reported in this paper were on a salt-poor diet for no longer than ten weeks. Unfortunately, the diet contained an excessive amount of salt.

If a salt-poor diet in the latter part of pregnancy shortens labor, the length of labor might show some variation with the duration of the salt-poor diet.

TABLE IV

NO. CASES	DURATION OF SALT-POOR DIET IN WEEKS	LENGTH OF LABOR—HOURS
18	3 to 6	8.0
13	7 to 10	7.2
11	11 to 14	7.2
2	15 to 18	7.0

There is a tendency for the length of labor to decrease with the duration of the salt-poor diet but it is not very marked. There is a noticeable reduction after the sixth week. From then on it does not seem to make much difference how much longer the salt is restricted.

Since all of the patients under consideration had normal pregnancies, we can consider the 24-hour chloride output as an indication of the efficacy of the salt-poor diet and may note how the length of labor varies with the extent of salt restriction.

TABLE V

	GRAMS SODIUM CHLORIDE		
	5 TO 5.9	6 TO 6.9	7 TO 7.9
No. Cases	6	14	7
Length of Labor—Hours	6.5	7.6	10.7

There seems to be a marked tendency for the duration of labor to increase with increasing salt output. Or to put it another way, the length of labor seems to decrease with greater salt restriction. The greater increase in the 7 to 7.9 group is due to one 26-hour labor without which the average length of labor for that group is 8.1 hours. A few scattered cases in other categories were not included in the table.

A salt-free diet implies that there is less than a gram of sodium chloride ingested per 24 hours. A salt-poor diet implies that the intake of sodium chloride is less than three grams per 24 hours. Dieckmann and Brown have stated that the pregnant patient with toxemia is, as a rule, adhering to her diet if the 24-hour excretion of sodium chloride in the urine is less than three grams. This, of course, would not hold in patients with an oliguria or with marked edema. It is disappointing to note that although all pregnancies studied were normal and the diets presumably strictly adhered to, yet the sodium chloride excretion on a salt-poor diet averaged about 6.5 grams per 24 hours. Unfortunately no studies could be made of the control group. I believe that the patients in my series were as carefully controlled as any reported in the literature with the possible exception of Reeb and Israel who did not consider a diet salt-free unless the 24-hour excretion of sodium chloride was less than two grams per liter. However, since the average 24-hour urine volume is 1,500 c.c. this would mean that the minimum excretion of sodium chloride by their patients was three grams per 24 hours, and the average excretion could have been and probably was much more.

There were fewer patients with toxemia in the salt-poor group than in the control which, of course, is to be expected.

Summary

1. A group of 50 patients were kept on a salt-poor diet for from 4 to 19 weeks before term, and their length of labor compared with that of another group of 50 used as a control.
2. These two groups were comparable with respect to age, environment, diets, and obstetric treatment.

3. The salt-poor group had a mean length labor 1.74 hours shorter than the control, but this difference was not found to be statistically significant.

4. There were smaller variations in the length of labor in the salt-poor diet group than in the control.

5. The tendency for labor to be shorter with greater salt restriction and with increasing duration of the salt-poor diet would seem to indicate that there might be a marked decrease in the length of labor with a true salt-poor diet.

I wish to thank Dr. Pearl Kendrick of the Michigan State Laboratories for the chloride determinations and Sylvia Kramer, Ph.D., of the department of obstetrics and gynecology, University of Chicago, for help in analyzing the results.

References

- Hofstein, J., and Petrequin: *Gynec. et obst.* 24: 133, 1931.
Karpati, J.: *Zentralbl. f. Gynäk.* 59: 2601, 1935.
Pomerance, W., and Daichman, I.: *AM. J. OBST. & GYNEC.* 40: 463, 1940.
Reeb, M.: *Gynec. et obst.* 38: 321, 1938.
Reeb, M., and Israel, L.: *Gynec. et obst.* 27: 193, 1933.
Wadlow, E.: *AM. J. OBST. & GYNEC.* 39: 749, 1940.

LEUCEMIA AND PREGNANCY

A Case Report and Review of the Literature

JOSEPH L. MCGOLDRICK, A.M., M.D., F.A.C.S., AND
WARREN A. LAPP, M.D., BROOKLYN, N. Y.

(From the Department of Obstetrics and Gynecology, Kings County Hospital)

A CASE of chronic myelogenous leucemia associated with pregnancy was recently encountered by us. The coexistence of pregnancy and leucemia is rare. A report of our case and a review of the literature are herewith presented.

Case Report

The patient, a 31-year-old white female, gravida viii, para vii, was referred to Kings County Hospital on December 19, 1942 by a local physician who had seen her earlier on the day of admission. She had had no prenatal care for this pregnancy. Her last menstrual period had begun on March 4, 1942; and the expected date of her confinement had been placed on December 11, 1942. Labor pains had begun at 2 A.M. on the morning of admission, being weak and ineffective, recurring every 15 to 30 minutes. A bloody show was noted at 10 A.M. On admission, the membranes were intact. Pains were recurring at 5- to 10-minute intervals, lasting 30 seconds, and of moderate intensity. The patient had not felt fetal activity for 36 hours prior to admission. She had noted no toxic symptoms throughout the gestation, except for a rash on her face which had become worse of late.

Past History.—A diagnosis of chronic myelogenous leucemia had been made 1½ years previously, and the patient had been admitted

to a city hospital near her on 9/6/41 for irradiation therapy to the spleen. Blood count on 10/2/41 was as follows: R.B.C. 3,800,000; Hemoglobin 80%; W.B.C. 176,000. The differential count revealed 15 polymorphonuclear leucocytes, 32 metamyelocytes, 30 myelocytes, and 23 myeloblasts. A total of 1,350 r. units was administered to the spleen. A blood count on 10/9/41 revealed a 90% hemoglobin and R.B.C. 4,760,000. The patient was last seen on 4/15/42, at which time the W.B.C. was 80,000. She was given 100 r. units to the spleen on that visit. Family history was noncontributory. Venereal history was denied. There were no previous operations. Menstrual: 14 by 28 by 3, cycle always regular. Obstetrical: 7 previous deliveries, there being 4 female infants, 3 male infants, each spontaneously at term. First delivery 1931. Last delivery 1940. Largest child weighed 8 $\frac{1}{4}$ pounds at birth.

Physical Examination.—The patient was an emaciated, white female, appearing chronically ill, but in no acute distress. Temperature 99° F., pulse 88, respirations 22. There was a maculopapular eruption on the face and chin, with some crusting present. The lungs were clear to percussion and auscultation. The heart sounds were of fair quality. No thrill or murmurs. Blood pressure 134/96. The spleen was palpable in the left upper quadrant, filled the entire left side of the abdomen, extended down almost to the iliac crest on the left, was solid, firm, not tender. The fundus of the uterus extended four fingers above the umbilicus. A fetal head was palpable in the fundus, while the breech was dipping in the pelvis. No fetal heart was heard. Pelvic measurements were ample. There was no lymphadenopathy. There was no edema of the extremities. On rectal examination, the cervix was not yet effaced or dilated.

Laboratory Data.—Urine was negative. R.B.C. 3,200,000. Hemoglobin 55%. W.B.C. 250,000. Differential count as follows: polymorphonuclear neutrophils 40, myeloblasts 10, metamyelocytes 25, myelocytes 15, lymphocytes 10.

At 4:20 P.M. on day of admission, patient delivered spontaneously a 6-pound stillborn male infant, LSA, frank breech presentation. Infant was macerated, but appeared normally developed in all respects. Duration of labor, 14 $\frac{1}{2}$ hours. Blood loss minimal.

The temperature was septic in type subsequent to delivery, rising to 102.6° F. orally on the first post-partum day, and rising less each successive day thereafter. The patient offered no complaints. The lochia was always adequate in amount and was not foul. There was no abnormal tenderness of the fundus or pelvic organs. Fundus remained firm and was involuting normally. Breasts were soft and atrophic. Face lesions cleared up with balsam of peru and sulfur ointment. The patient was placed on a sulfathiazole routine empirically on 12/23/42. On 12/26/42, the patient complained of pain in her left ear. Examination revealed a left acute catarrhal otitis media, not marked, associated with a catarrhal rhinitis.

Throughout her hospital course, the patient refused many of her medications. She was uncooperative, depressed, and occasionally emotionally unstable. She refused blood transfusions. She refused food. On December 26, 1942, the patient signed her release and left the ward, despite advice to the contrary. The temperature on discharge was 99.6° F. orally, pulse 120.

The patient failed to return to us for any subsequent postpartum checkup; but when called upon by a member of the Visiting Nurses Association, the patient was found to be up and around, able to do her housework, and offering no complaints. She was advised to return to the city hospital nearest her, which had given her the irradiation therapy previously, for further blood studies and possible irradiation courses. The patient was last seen there on June 2, 1943, at which time her condition was fair, and she was given 600 r. units to the spleen.

Review of Literature

The coexistence of pregnancy and leukemia is rare. So far as is known, there have been only two men who have themselves seen as many as three cases of leukemia associated with pregnancy.⁸³ Grier and Richter,⁸⁴ in 1939, reported a total of 75 cases collected from the literature, of which they used 62 cases for statistical studies. Extensive summaries of the literature have been previously reported by Kosmak,²⁹ Ohlsson,⁴¹ Bower and Clark,⁴² Neumann,⁴⁷ Debiasi,⁶⁰ Garassi,⁶⁵ Mehta,⁷² and Forkner.⁸⁰

At the present time, we have been able to collect references to 111 cases, of which in 79, we feel the diagnosis of leukemia associated with pregnancy is sufficiently well enough substantiated to be used for statistical purposes.

There doubtless have been a number of cases of pregnancy occurring with leukemia which have never been reported in the literature. Other cases have gone unnoticed, because they were included in surveys and topical discussions of leukemia, with no special emphasis placed on the presence of pregnancy.

As first noted by Forkner,⁸⁰ the cases reported by Ingle,² Stillman,⁶ and Sutcliffe²¹ cannot be accepted because the diagnoses were not definitely established and it is possible that the patients were not leukemic. In the cases reported by Paterson (3 cases),¹ Greene (2nd case),³ Herman,¹³ and Galabin,¹⁴ the data are incomplete and though these may have been cases of leukemia associated with pregnancy, they cannot be accepted as such. The case reports presented by Nagy,³⁸ Donati,⁷³ Tschopp,⁸⁵ and Laforet⁹⁴ could not be obtained for inclusion in our study. In the cases reported by Savarè (2 cases),¹⁸ Debiasi (1st case),⁶⁰ and Pontoni,⁷⁴ the data presented seemed to suggest diagnoses other than leukemia and hence are not included here. In 8 other cases, the authors, i.e., Brant;³⁵ Schreiner and Mattick;³⁹ Sergent and Mignot;⁴³ Hauch;⁸⁶ and Erf, Tuttle, and Lawrence⁹¹ have merely mentioned that they had encountered cases of pregnancy associated with leukemia. The data thus presented are inadequate for statistical use.

A few cases of leukemia beginning after the termination of pregnancy have been reported. The cases observed by Jaggard,⁷ Schenk,³⁶ Haining, Kimball, and Janes,⁶⁸ and by Forkner⁸⁰ are described elsewhere in more detail. Forkner cites the observations of Ward²⁵ who found 4 cases in which leukemia began soon after parturition. Forkner also includes the case report by Marmol who observed a fatal case of leukemia, beginning two months after a normal childbirth. Leube and Fleischner⁸ described a case of myelogenous leukemia developing 4

months post partum, which ended fatally six weeks later. The case reported by Isaacs⁷⁵ is unusual in that the patient who was suffering from lymphosarcoma had a remission during pregnancy, with the onset of a lymphosarcoma cell leucemia eight months post partum.

The association of pregnancy with leucemia etiologically, is a factor to be considered. Cameron⁵ favored the idea that a reciprocal relationship existed between the two. Sanger⁴ stated that pregnancy neither affected the origin nor the course of leucemia. Debiassi⁶⁰ felt that, though pregnancy was not the etiological factor in the production of leucemia, it at least acted as the releasing cause. Hussy⁶⁶ conjectured that leucemia was due to a toxic principle elaborated by the pregnancy.

In classifying our cases depending upon the blood studies, we found 34 acute leucemias associated with pregnancy as compared to 45 chronic cases. Statistics on 75 cases developing leucemia prior to or during pregnancy are herewith reported.

Of the acute cases, 17 were of the myelogenous type, 9 were lymphatic, 2 hemocytoblastic, and 3 were unclassified. The onset of the disease in all but two cases occurred after the onset of pregnancy. The disease seemed to bear no other relationship in onset to the length of gestation, except that several more cases were reported as beginning in the seventh month than for the other months of gestation. Parity likewise seemed to bear no relationship to the onset of the disease; and as would be expected, the greater number of cases was noted in primiparas and uniparas. The average age of the patient at the time of onset of the leucemia was 28.04 years. Life expectancy after onset of the disease averaged about ten weeks. Maternal mortality was 100 per cent. Four died during pregnancy; 5 died during parturition; 22 died post partum. Only two cases lived as long as 14 days after delivery. Fetal mortality was 60 per cent, there being 9 stillborn infants and 3 neonatal deaths as compared to 8 live babies obtained. Severe post-partum hemorrhage was encountered in 5 cases, which was fatal in 2 instances. Of 20 cases which were not artificially interrupted, 9 proceeded to term, while 11 had spontaneous induction of premature labor. Only three stillborn infants were obtained when the pregnancy was allowed to proceed to term.

The prognosis seemed better if the patient was affected with the chronic type of leucemia. Of the 44 cases thus included here, 41 were of the myelogenous and 3 were of the lymphatic type. The average age of the patient at the time of onset of the disease in chronic leucemias was 30.63 years. Though observed in three primiparous patients, chronic leucemia seemed more closely associated with multiparity than did the acute forms. Only 6 cases developed chronic leucemia during the pregnancy, 51.3 per cent having had chronic leucemia for longer than 1 year before conception occurred. Maternal mortality here reached 36.5 per cent. One patient died undelivered, one during parturition, one shortly post partum, and 12 within one year after parturition. Of those cases not interrupted, 20 went on to full term before labor began. In 2 other instances, labor began spontaneously at 8½ months; in 8 cases, labor began spontaneously at 8 months or less. Severe hemorrhage was noted in only three cases, it being fatal in one of these three. Fetal mortality in the case of chronic leucemias was 16.4 per cent. Only two stillborn infants were noted; also three neonatal deaths due to prematurity. Healthy twins were delivered on two occasions.

As noted previously, pregnancy complicating chronic lymphatic leucemia is very infrequent. Russell⁶³ considered his case as being an example of the lymphogenous type and as such, is included here; although Grier and Richter felt that it should be included as an acute or subacute type because of the rapid course of the disease after onset. Langer,⁶⁹ in 1935, reported a case of chronic lymphatic leucemia, present for 3 years, complicated by pregnancy. A normal infant was delivered at term without ill effect to the mother. Harrison and Reeves,⁶⁹ in 1939, reported a case of chronic lymphatic leucemia of 8 months duration complicated by pregnancy, on whom an abortion was induced at 2 to 3 months gestation, without ill effect to the mother.

Jaggard,⁷ in 1890, described the first case of leucemia developing in the post-partum period. His patient, a 34-year-old multipara, after an apparently normal gestation and parturition, developed an acute leucemia 6 weeks later. Schenk,³⁶ in 1923, reported the case of a 21-year-old female who had a spontaneous abortion at 2 months' gestation. Three months later she was operated for what proved to be a ruptured corpus luteum cyst, immediately after which she developed an acute myelogenous leucemia. The case reported by Haining, Kimball, and Janes⁶⁸ was unusual, in that the patient developed an acute monocytic leucemia approximately 6 months after a normal delivery. The patient died 6 months later, following a left inguinal colostomy for intestinal obstruction due to a localized reticulosis of the rectum. Forkner⁸⁰ reported the onset of a subacute or chronic myelogenous leucemia, beginning late in the pregnancy or early in the puerperium, the patient dying ten months after parturition and the onset of symptoms.

Leucemia seems to predispose to spontaneous induction of premature labor. Of 49 cases of acute and chronic leucemias allowed to progress in their pregnancies without interference, 21 cases, or 42.8 per cent, developed premature labor.

Likewise, cases which had been subjected to considerable irradiation by either roentgen ray or radium and in whom sterilization might well be considered a good possibility by virtue of this exposure, have conceived and carried to term, delivering normal infants.^{28, 33, 42, 44, 45, 51}

Although hemorrhagic diatheses are supposedly part of the leucemic picture, it is to be noted that only three fatal hemorrhages were observed in a series of 75 cases. The case of Lazarus and Fleischmann¹⁵ died of hemorrhage in the third stage of labor, following a spontaneous abortion at 5 months' gestation. The case of Geller⁴⁹ had a fatal hemorrhage 2 hours after a cesarean section. Saidl⁵³ ascribed the fatality in his case to post-partum hemorrhage due to uterine atony.

Several authors have observed that their patients withstood parturition fairly well, only to go into profound collapse shortly thereafter, from which they failed to respond despite vigorous and often heroic treatment. Exitus was usually rapid following the collapse. No explanation for this was determined at necropsy.

An acute exacerbation of the leucemic process has been frequently noted following parturition. The white cell count shows a rapid elevation of immature cells which can only be controlled by appropriate measures, preferably irradiation. For the most part, however, it would seem that the course of leucemia is not greatly, if at all, affected by the pregnancy. In a few instances, overdilatation of the abdomen as a result of the enlarging uterus in the presence of a greatly enlarged liver and spleen has caused discomfort to the patient. Herman¹³ felt

that under such circumstances, premature termination of the pregnancy would be advisable.

Autopsies on leucemic females have frequently shown extensive leucemic infiltrations of the genital tract, especially of the ovaries and uterus. This would seem to limit the frequency of pregnancies occurring with the disease, but as reported by Cameron⁵ and Neumann,⁴⁷ several pregnancies may be observed in the same patient during the course of her disease.

Hofstein⁵⁵ favors the theory that the prognosis for the mother decreases with each successive pregnancy; and that in the late stages of leucemia, pregnancy is not well supported. If pregnancy occurs during the first year or two of chronic leucemia, Hofstein feels that there is a good chance of delivery at term without much danger for the mother. Neumann⁴⁷ and Brandstrup⁷⁶ also adhere to these views.

No leucemic child has ever been delivered of a leucemic mother. This is hardly what one would expect. Leucemia has been transmitted from one animal to another in the laboratory, using related mice or fowl. It is therefore indeed surprising that leucemia in the pregnant woman is not transmitted to the offspring, inasmuch as leucemic cells, much like neoplastic cells, seem able to invade surrounding and distant tissues.

Cameron⁵ observed a leucemic blood picture on the maternal side of the placenta in the intervillous spaces, with a normal blood picture on the fetal side in the chorionic villi. Lindbrones,²⁶ Hilbert,¹⁰ and Askanazy¹¹ made similar observations. It would seem that the placenta acts as a barrier to the transmission of the disease process.

Congenital leucemia has been observed, but in no case was the leucemic child ever born of leucemic parents. Sanger⁴ reported a case of a premature stillborn infant who at autopsy showed all the characteristics of a true leucemia. Koch³² reported a similar case in 1922. Geshichter and Widenhorn⁶⁷ in 1934 reported a case in which the infant died of acute leucemia 9½ hours after birth. In 1939, Morrison, Samwick, and Rubinstein⁸⁷ tabulated 27 cases which had been reported as being examples of congenital leucemia. Of these, the authors accepted 7 as being cases in which the diagnoses were truly substantiated.

Opinions concerning therapeutic procedures to be adopted in pregnant leucemic patients are by no means uniform. Ohlsson,⁴¹ Saidl,⁵³ Naujoks,⁵⁴ and Hofstein⁵⁵ advised that early pregnancy should be interrupted at once. In general, however, it is the opinion of most authors that the shock of interruption is just as great as at parturition. Inasmuch as the course or outcome are little if any affected by the progress of the pregnancy, it would seem advisable to allow the pregnancy to continue. Taussig⁷⁰ states that in acute leucemia there is so little to gain by the abortion that it hardly if ever is justified. Interruption may be justified in terminal cases where the possibility of saving a viable infant presents itself.

The use of arsenic as a method of treatment of chronic leucemia during the progress of pregnancy deserves consideration, and it may be shown that this is the most rational procedure. The undesirable effects on the fetus of irradiation, as pointed out by Rolleston,⁵¹ Murphy,⁹⁰ and Murphy, Shirlock, and Doll⁹² preclude its use during pregnancy. There is no contraindication to the use of Fowler's solution during pregnancy, and experimental evidence seems to indicate that inorganic arsenic reacts favorably on the health and physical state of the fetus.

References

1. Paterson, R.: *Edinburgh M. J.* 15: 1073, 1869-70.
2. Ingle: *Lancet* 1: 334, 1880.
3. Greene, J. L.: *New York Med. J.* 47: 144, 1888.
4. Sänger, M.: *Archiv. f. Gynäk.* 33: 161, 1888.
5. Cameron, J. C.: *Am. J. M. Sc.* 95: 28, 1888; 100: 479, 1890.
6. Stillman: Cited by Cameron, J. C.: *Am. J. M. Sc.* 100: 479, 1890.
7. Jaggard, W. W.: *Med. News* 57: 49, 1890.
8. Leube and Fleischer: Cited by Jaggard, W. W.: *Med. News* 57: 49, 1890.
9. Laubenberg, C.: *Arch. f. Gynäk.* 40: 419, 1891.
10. Hilbert: *Deutsche med. Wehnschr.* 19: 875, 1893.
11. Askanazy, M.: *Virchows Arch. f. path. Anat.* 137: 1, 1894.
12. Schroeder, H.: *Arch. f. Gynäk.* 57: 26, 1898.
13. Herman, G. E.: *Lancet* 2: 981, 1901.
14. Galabin, A. L.: Cited by Herman, G. E.: *Lancet* 2: 981, 1901.
15. Lazarus, P., and Fleischmann, C.: *Deutsche med. Wehnschr.* 42: 1209, 1905.
16. Joachim, G.: *Ztschr. f. klin. Med.* 60: 1, 1906.
17. Bostetter: *Zentralbl. f. Gynäk.* 30: 265, 1906.
18. Savare, M.: *Ginecologia (Firenze)* 6: 129, 1909.
19. Kleineberger, C.: *Strahlentherapie, Berl. u. Wien.* 2: 573, 1913.
20. Melinkow, G., and Zomakion, F.: *Russk. Vrach. S-Peterb.* 12: 294, 315, 1913.
21. Sutcliffe, L. E.: *Brit. M. J.* 2: 570, 1914.
22. Peterson, A.: *Arch. f. Gynäk.* 103: 272, 1914.
23. Gasser, L.: *Ueber die Kombination von Schwangerschaft mit Leukämie, München, 1914, R. Müller and Steiniche.*
24. Thaler, F. H.: *Zentralbl. f. Gynäk.* 29: 1029, 1914.
25. Ward, G.: *Brit. J. Child. Dis.* 14: 10, 1917.
26. Lindbrones, G.: *Svenska läk-sällsk. handl.* 45: 83, 1919.
27. Wallgren, A.: *Acta med. Scandinav.* 54: 133, 1920-21.
28. Renon, L., and Degrais P.: *Bull. et mém. Soc. méd. d. hôp. de Paris* 44: 1511, 1920.
29. Kosmak, G. W.: *Am. J. Obst.* 1: 485, 1921.
30. Meurer, R. J. T.: *Nederl. tijdschr. v. geneesk.* 2: 1440, 1921.
31. Jimenez G. de la Serrana, M., and Haro, F.: *Med. iberica, Madrid* 15: 97, 1921.
32. Koch: *Zentralbl. f. allg. Path. u. path. Anat.* 33: 7, 1922.
33. Hausam, E.: *München med. Wehnschr.* 69: 1627, 1922.
34. Labhardt, A.: *Oberrheinische Gesellschaft f. g. u. G. Sitzung, Basel—March 26, 1922.*
35. Brant, T.: *Norsk. Mag. f. Saegevidenskaben Christiania* 84: 761, 1923.
36. Schenk, S. B.: *Long Island M. J.* 17: 138, 1923.
37. Fleischmann, C.: *Zentralbl. f. Gynäk.* 47: 1277, 1923.
38. Nagy, T.: *Gyógyászat* 54: 1924.
39. Schreiner, B. F., and Mattick, W. L.: *Am. J. Roentgenol.* 12: 126, 1924.
40. Frank, K. G.: *Leukämia und Schwangerschaft, Zurich, 1924.*
41. Ohlsson, I.: *Acta obst. et gynec. Scandinav.* 3: 317, 1925.
42. Bower, J. O., and Clark, J. H.: *Am. J. Obst. & Gynec.* 9: 207, 1925.
43. Sergeant, E., and Mignot, R.: *Paris méd.* 57: 468, 1925.
44. Chiari, R., and Dautwitz, F.: *Wien. Arch. f. inn. Med.* 11: 475, 1925.
45. Thamer, H.: *Im. Dissert. Marburg, 1925.*
46. Kaplan, A.: *J. akush. i. zhensk boliez.* 38: 785, 1927.
47. Neumann, H. O.: *Ztschr. f. Geburtsh. u. Gynäk.* 94: 412, 1928-9; *Zentralbl. f. Gynäk.* 54: 2443, 1930; *Deutsche med. Wehnschr.* 58: 292, 1932.
48. Allan, William: *Am. J. Obst. & Gynec.* 16: 112, 1928.
49. Geller, F. C.: *Zentralbl. f. Gynäk.* 53: 952, 1929.
50. Lammers, H.: *Nederl. tijdschr. v. geneesk.* 1: 316, 1929.
51. Rolleston, H.: *Quart. J. Med.* 24: 101, 1930.
52. Ridder, V.: *München med. Wehnschr.* 77: 2057, 1930.
53. Saidl, J.: *Cäs. lek. česk.* 70: 949, 1931.
54. Naujoks, H.: *Ztschr. f. Geburtsh. u. Gynäk.* 99: 464, 1931.
55. Hofstein, J.: *Strasbourg méd.* 91: 611, 1931; *Gynéc. et otst.* 25: 45, 1932.
56. Mann, B.: *Am. J. Obst. & Gynec.* 22: 416, 1931.
57. Weber, T.: *Rev. Ostetr. (Rumena)* 10: 112, 1931.
58. Recék, V.: *Cäs. lek. česk.* 70: 93, 1931.
59. Held, E.: *Rev. franç. de gynéc. et d'obst.* 26: 543, 1931.
60. Debiasi, E.: *Folia gynaec.* 28: 455, 1932.
61. Heim, K.: *Zentralbl. f. Gynäk.* 56: 22, 1932.
62. Rydzewska, J.: *Ginek polska* 11: 707, 1932.

63. Russell, H. K.: *Am. J. Obst. & Gynec.* 25: 493, 1933.
64. Baldrige, C. W., and Fowler, W. M.: *Arch. Int. Med.* 52: 852, 1933.
65. Garassi, G.: *Riv. ital. di ginec.* 16: 295, 1934.
66. Hüsey, P.: *Schweiz. med. Wehnschr.* 64: 629, 1934.
67. Geshichter, C. F., and Widenhorn, H.: *Am. J. Cancer* 22: 620, 1934.
68. Haining, R. B., Kimball, T. S., and Janes, O. W.: *Arch. Int. Med.* 55: 574, 1935.
69. Langer, Heinz: *Am. J. Roentgenol.* 34: 214, 1935.
70. Taussig, F. J.: *Abortion, Spontaneous and Induced*, St. Louis, 1936, The C. V. Mosby Company, Pp. 306-307.
71. Bentivoglio, F.: *Folia gynae.* 33: 53, 1936.
72. Mehta, C.: *J. Obst. and Gynaec. Brit. Emp.* 44: 328, 1937.
73. Donati, A.: *Folia clin. et biol. Brasil* 1: 47, 1939.
74. Pontoni, L.: *Minerva med.* 1: 415, 1937.
75. Isaacs, R.: *Ann. Int. Med.* 11: 657, 1937.
76. Brandstrup, E.: *Acta obst. et gynec. Scandinav.* 17: 284, 1937.
77. Traina Rao, G.: *Clin. obstet.* 39: 76, 1937.
78. Kandel, E. V., and Le Roy, G. V.: *Arch. Int. Med.* 60: 856, 1937.
79. Zanela, S.: *Zentralbl. f. Gynäk.* 61: 763, 1937.
80. Forkner, C. E.: *Internat. Clin.* 2: 29, 1938.
81. Erf, L. A., and Fine, Archie: *Am. J. M. Sc.* 195: 8, 1938.
82. Zambonini, R.: *Atti. Soc. ital. di ostet. e. ginec.* 34: 747, 1938.
83. Grier, R. M.: *Am. J. Obst. & Gynec.* 37: 425, 1939.
84. Grier, R. M., and Richter, H. A.: *Am. J. Obst. & Gynec.* 37: 412, 1939.
85. Tschopp, W.: *Folia haemat.* 61: 319, 1939.
86. Hauch, C. D.: *Am. J. Obst. & Gynec.* 37: 424, 1939.
87. Morrison, M., Samwick, A. A., and Rubinstein, R. I.: *Am. J. Dis. Child.* 58: 332, 1939.
88. Herrnberger, K.: *Zentralbl. f. Gynäk.* 63: 2309, 1939.
89. Harrison, E. K., and Reeves, R. J.: *Radiology* 32: 284, 1939.
90. Murphy, William M.: *J. A. M. A.* 115: 156, 1940.
91. Erf, L. A., Tuttle, L. W., and Lawrence, J. H.: *Ann. Int. Med.* 15: 487, 1941.
92. Murphy, D. P., Shirlock, M. E., and Doll, E. A.: *Am. J. Roentgenol.* 48: 356, 1942.
93. Committee on Maternal Welfare, Massachusetts: *New England J. Med.* 226: 932, 1942.
94. Laforet, C. C.: *Rev. clin. espan.* 4: 260, 1942.

55 EIGHTH AVENUE
451 CLARKSON AVENUE

Sheehan, H. L., and McLetchie, H. G. B.: *Simmonds' Disease Due to Post-Partum Necrosis of the Anterior Pituitary*, *J. Obst. & Gynaec. Brit. Emp.* 50: 27, 1943.

The authors report a rather rare case of Simmonds' disease due to postpartum necrosis of the pituitary gland. The patient died six days after delivery of the child. The characteristic clinical course of the disease was present, and the findings were confirmed by autopsy. A true "pituitary cachexia" was present clinically.

Treatment of these cases is not very successful. Other authors (Sheehan and Murdoch) have found that the production of a subsequent pregnancy leads to definite clinical improvement. Endocrine substitution therapy has given some promising results. The patient should also be on a salt diet and should never go a single day without an adequate food intake.

WILLIAM BERMAN.

ECTOPIC DECIDUA IN VERMIFORM APPENDIX

Showing (1) Acute Appendicitis and (2) Acute Periappendicitis

S. SANES, M.D., AND AMOUR F. LIBER, M.D., BUFFALO, N. Y.

(From the Edward J. Meyer Memorial Hospital, Buffalo, N. Y., and the Montgomery County Laboratories, Amsterdam, N. Y.)

ALTHOUGH its occurrence in the appendix is well known enough to receive mention in obstetric textbooks, ectopic decidua, to our knowledge, has not been reported in the American literature as an incidental finding in a surgical specimen showing either acute appendicitis or acute periappendicitis. By discovery in our cases of decidua in the inflamed appendix during routine examination, the pathologist was able to make—in addition to that of acute appendicitis, and periappendicitis—the diagnosis of pregnancy without clinical information concerning the condition of the patient.

Case 1.—Pathologic Description: The Laboratory of the E. J. Meyer Memorial Hospital, Buffalo, New York, received for routine examination an appendix and an isolated fibroid which had been removed by Dr. James O'Connor from a 35-year-old white woman on April 17, 1942, at the DeGraff Memorial Hospital, North Tonawanda, New York. No other clinical information accompanied the specimens.

Appendix.—Microscopically, it revealed acute diffuse phlegmonous appendicitis with focal lesions in mucosa, and fibrinopurulent periappendicitis. Of particular interest were certain findings in the subserosa. In this layer, scattered at different levels, were complexes of decidual cells (Fig. 1). Some of these were situated close to the outer muscle layer. Some surrounded blood vessels. Others lay just beneath serosa where in places they formed elevations of the surface. In certain complexes, decidual cells were separated by edema. There was also interstitial infiltration of neutrophils. Many decidual cells showed regressive changes. Spaced serial sections of the appendix disclosed no signs of endometriosis.

Microscopically, the tumor was a leiomyoma. Interestingly enough, there were changes commonly found in pregnancy: interstitial edema and swelling of cells with double nuclei and mitotic figures. In its outer portion, the leiomyoma showed acute inflammation with leucocytic infiltration and with fibrinopurulent exudate. There was no decidual reaction on the surface.

The pathologic diagnosis was acute appendicitis and periappendicitis; ectopic decidua in appendix (pregnancy); leiomyoma.

Clinical History.—The patient entered the hospital April 17, 1942, with the complaint of nausea of 12 hours' duration. Abdominal tenderness and muscle spasm, and leucocytosis were found on examination. The last menstrual period occurred October 10, 1941.

At operation, the uterus was noted to be the size of a 7 months' pregnancy. A lemon-sized, pedunculated, subserous fibroid that presented itself anterior to the right tube was excised. When the cecum was exposed, purulent fluid escaped. The appendix was acutely inflamed. It was not adherent to uterus or adnexa. Sulfanilamide powder was

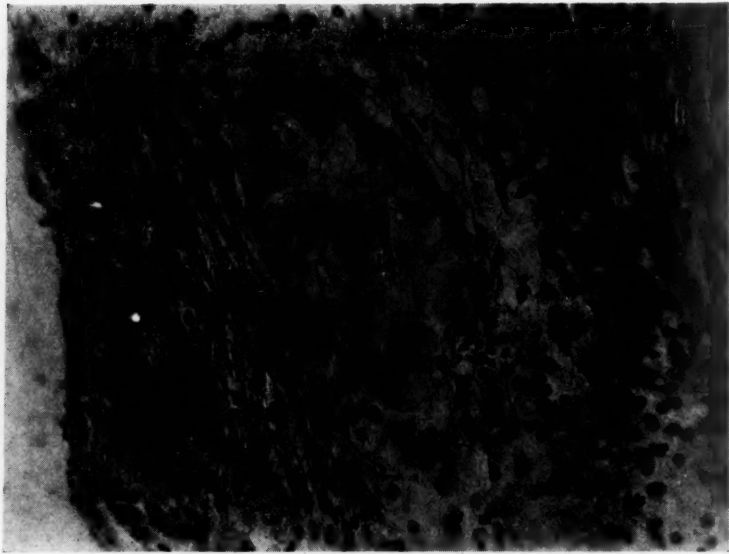


Fig. 1.—Decidual cells in acutely inflamed appendix of Case 1.

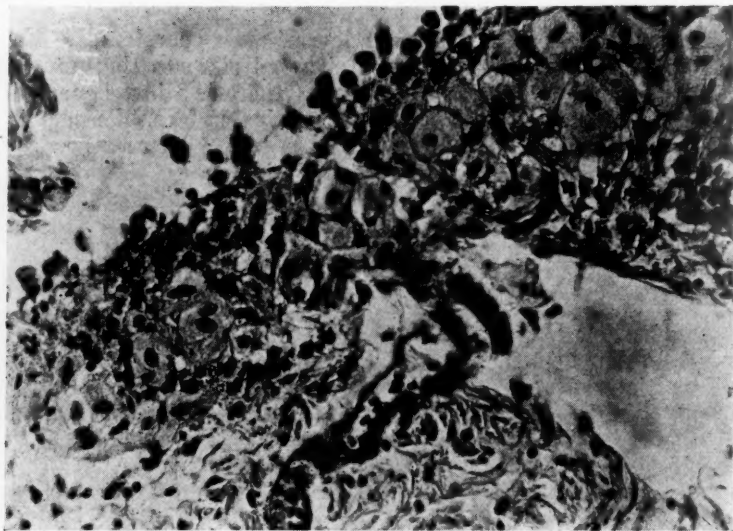


Fig. 2.—Decidual cells in appendix of Case 2.

placed in peritoneal cavity; drains were inserted. The postoperative diagnosis was acute appendicitis; localized peritonitis; uterine fibroid; pregnancy (about 7 months).

Except for cyanosis in the first three days after operation, the patient had an uneventful recovery. On June 28, 1942, she gave birth to a premature female infant, weight 4 pounds 4 ounces.

Case 2.—Pathologic Description: The Montgomery County Laboratory received an appendix with fibrinopurulent exudate both over and beneath its partially eroded serosa, which had been removed by Dr. Roman R. Violyn from a 31-year-old white woman at St. Mary's Hospital, Amsterdam, New York.

Microscopic Findings.—The mucosa, submucosa and circular musculature of the appendix were intact. The longitudinal muscle showed slight neutrophilic infiltration in its outer portions, increasing rapidly in density until, in the subserosa, there appeared an intense and diffuse purulent infiltrate. The mesothelial cells were swollen and desquamated. Immediately beneath the mesothelium or a short distance within the subserosa and mesentery, were large cells arranged in small groups and concentric layers 2 to 6 cells in thickness. The cells measured from 15 to 30 micra in diameter, with sharp borders, having rounded forms at the edges of the groups and polygonal in the interior. The cytoplasm stained a pale, slightly bluish-pink, and in many cells, it contained a lacy structure of small vacuoles of varying size and shape, most marked at the periphery of the cell. The diffusely staining, rounded nuclei occupied about $\frac{1}{5}$ of the cell's diameter. A few cells contained 2 or 3 nuclei, but the majority were uninuclear.

The pathologic diagnosis was acute periappendicitis, ectopic decidua in appendix (pregnancy).

Clinical History.—The patient entered the hospital with the complaints of acute abdominal pain, nausea, vomiting, fever, and tenderness in the right lower quadrant. Appendectomy was performed ten hours after onset of symptoms. The temperature declined with descending oscillations until the patient's discharge from the hospital, 18 days after the operation.

The patient had one child, aged 7 years, and had had no other known pregnancies. The menstrual period before the abdominal episode was absent, but the date of the last period was not stated. During the three days following the operation there was vaginal bleeding stated by the patient to resemble a normal menstrual period. A Friedman test was negative on the twelfth postoperative day.

Summary

In two cases of acute appendicitis, and acute periappendicitis, decidual cells were observed in the subserosa of the surgically removed specimen. A diagnosis of pregnancy was made by the pathologist without clinical information. In the first case pregnancy was in the seventh month. In the second case sequence of events suggested that fetal death occurred in the first month.

EXTERNAL VERSION FOLLOWED BY PLACENTAL SEPARATION AND SHOCK: RECOVERY AFTER CESAREAN HYSTERECTOMY

L. D. ODELL, M.D., IOWA CITY, IOWA

(From the Department of Obstetrics and Gynecology, State University of Iowa)

SINCE its introduction in 1807, external version (Wiegand method) has been used extensively to convert breech to more favorable cephalic presentations. In a collected review from 9 authors, Adair¹ reports only 2 patients with slight vaginal bleeding (presumably from placental separation) in 1,105 attempted external versions, and Newell² states that complications from external version are rare. Three additional cases^{4, 5} of premature separation of the placenta following external version have been collected. One maternal death occurred (Couvellaire uterus demonstrated at autopsy). The infants were stillborn.

Although external version favors a reduction of fetal mortality rate and is usually a safe and desirable procedure, optimistic reports concerning its safety^{1, 2} should not lead to the neglect of certain precautions. Such complications as compound presentation, premature rupture of the membranes with presentation of the cord, fetal death from cord entanglement, and premature separation of the normally implanted placenta should be avoided if possible. It is doubtful if external version is advisable in the presence of a hypertensive syndrome. The use of anesthesia to promote relaxation probably makes the procedure more hazardous. A recent patient at the University Hospitals illustrates these latter points.

Case No. 42-14109.—C. M., 33 years of age, para iii, gravida v, was admitted on December 12, 1942, approximately eight and one-half months pregnant. A history of a 33-pound weight gain and recent edema was obtained. Although hypertension had been discovered early in pregnancy, there were no subjective symptoms. The first pregnancy in 1929 was complicated by edema, proteinuria and hypertension, but succeeding pregnancies were not toxemic. The past medical history revealed: scarlet fever without sequelae, nonsurgical treatment for hyperthyroidism in 1929, and severe pyelitis of pregnancy in 1931. There was a maternal familial history of hypertensive disease.

Examination disclosed a blood pressure of 180/120 mm., one plus albuminuria, with a few granular casts, slight ankle edema, and a breech presentation of an 8½ months' gestation. Electrocardiogram, x-ray studies for cardiac size, kidney function tests, and blood chemistry were entirely normal. Ophthalmoscopic examination showed generalized arteriolar constriction, a condition compatible with permanent vascular damage. On two occasions the cold pressor test⁶ resulted in no significant rise in systolic blood pressure although the diastolic pressure rose 16 and 20 mm. A consulting ophthalmologist described retinal angiospasm while the hand was immersed in ice water. The response to barbiturates⁷ was a moderate decrease in systolic (30 mm.) without significant change in diastolic blood pressure.

During a hydration regimen⁸ no diuresis (weight loss), reduction of blood pressure, or decrease in proteinuria occurred. In fact, on Janu-

ary 2, 1943, the blood pressure reached 210/130 mm., and symptoms of headache, blurring of vision, and dizziness appeared. Induction of labor was considered advisable, and to obtain a cephalic presentation, a successful external version (Wiegand method) was performed on January 4, 1943. However, the infant returned spontaneously to a breech, and the second attempt at external version was unsuccessful.

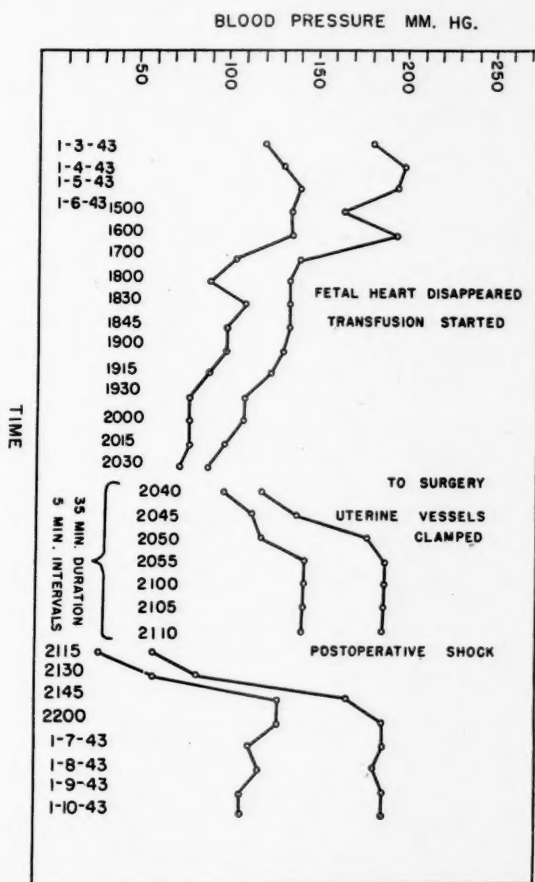


Fig. 1.—Blood pressure record showing abrupt rise when subtotal hysterectomy was performed. Inasmuch as the blood loss was minimal it is believed that some toxic substance (liberated from the placental site) accounted for the first episode of shock. It is believed that the second episode of shock resulted from the operative procedure. The hours in this graph designate Army-Navy time, — e.g., 1900 is 7 P. M.

Under cyclopropane anesthesia, a third external version was unsuccessful. A bipolar attempt (one finger in cervix to dislodge breech) at version also failed. The patient was transferred to bed, with a blood pressure of 195/140 mm. and normal fetal heart tones. Routine pituitrin induction of labor was started at 3 P.M. and the membranes ruptured spontaneously at 3:45. At 4 o'clock, weak contractions began and 150 c.c. of dark blood was passed vaginally. Following this bleeding episode the fetal heart tones disappeared and the blood pressure gradually declined (Fig. 1).

The importance of a steadily declining blood pressure without clinical improvement⁹ was appreciated. Therefore, blood transfusion was started at 6 P.M., and 1,500 c.c. of glucose citrate blood were given in the next few hours. Notwithstanding this supportive measure, the blood pressure continued to fall (100/80 mm., pulse 128/minute, at 7:45 P.M.) (Fig. 1). Cold, clammy skin and vomiting appeared to complete the clinical picture of shock. Examination disclosed an undilated cervix and no uterine contractions. An emergency subtotal hysterectomy was performed under cyclopropane anesthesia. As the uterine vessels were clamped, the blood pressure suddenly rose to a sustained high of 190/145 mm. Although the blood pressure fell to shock level soon after operation, normal readings were re-established within 15 minutes. An uncomplicated puerperium ensued. Kidney function studies and blood chemistry were entirely normal on the seventh postoperative day. The patient was discharged on the twelfth postoperative day with a blood pressure of 180/120 and no proteinuria.

TABLE I.—RESULTS OF COLD PRESSURE TEST*

PA-TIENT	HOS-PITAL NUMBER	P	G	RETINAL FINDINGS BEFORE COLD PRESSURE TEST			B.P. AT REST IN MM.	IMMERSION IN ICE WATER FOR 1 MINUTE		ANGIO-SPASM OBSERVED DURING ICE WATER IMMERSION
				GENER-ALIZED CON-STRICT-ION	LOCAL-IZED SPASM	NOR-MAL FUNDI		RISE IN SYSTOLIC B.P. MM.	RISE IN DIASTOLIC B.P. MM.	
E. M.	42-14090	9	10	+			150/90	30	24	+
E. C.	42-14039	5	6	+			160/100	10	20	+
W. H.	42-13620	0	1	+			180/120	20	24	+
A. F.	42-13626	0	1		+		150/110	10	20	+
C. M.	42-14109	3	5	+	+		176/110	14	16	+
M. D.	41-13248	0	1			+	150/90	26	30	+
M. P.	38-16344	0	1	+			180/120	40	40	+
B. H.	41-15534	0	1			+	140/90	0	16	+
M. S.	42-4494	0	1			+	130/80	8	20	+
E. K.	41-14173	0	1		+		150/104	10	20	+
M. Mc.	38-23122	5	6			+	140/94	20	14	+
F. S.	41-8121	0	1			+	130/84	34	24	+
M. S.	42-449	0	1	+			170/110	40	30	+

*Note the consistent rise in diastolic blood pressure (over 14 mm.) in those hypertensive patients exhibiting retinal angiospasm during immersion of the hand in ice water. The behavior of the systolic blood pressure was inconclusive. According to Selinger¹⁰ the most consistent retinal findings in pregnant patients exhibiting a hypertensive syndrome are generalized arteriolar constriction or localized vascular spasm.

In the group of patients demonstrating retinal angiospasm during ice water immersion, the clinical impression was: Moderately severe pre-eclampsia (A. F.), severe pre-eclampsia (M.D., M.S., E.K., F.S., M.S.), mild cardiovascular disease (E.C., B.H., M.M.) and severe cardiovascular disease (A.M., D.H., C.M., M.P.).

Examination of the gross specimen disclosed a few subserosal ecchymoses. Upon opening the uterus, a 2,600 gram, female infant was removed. The placenta which was attached to the anterosuperior portion of the body was three-quarters separated by a 200 c.c. retroplacental hematoma. Several sections through the uterus failed to show hemorrhagic infiltration.

Comment

In a patient with a hypertensive syndrome, external version under anesthesia is ill advised. It is difficult for the operator to refrain from vigorous manipulation when the abdominal musculature is relaxed.

The natural, muscular defenses of the conscious patient are good insurance against trauma during external version. In the case reviewed, bag induction of labor instead of attempted external version would probably have given more satisfactory results.

The progressive fall in blood pressure notwithstanding early blood transfusion, the appearance of clinical shock, and the rapid return to normal level when the uterine blood supply was interrupted, suggest a toxic substance (possibly released from the uterine placental site) as an etiologic factor. Although hemorrhage has been suggested as the principal cause of shock (and death) in patients with premature separation of the normally implanted placenta, blood loss in this case did not exceed 400 c.c., ordinarily an insignificant amount. It is difficult to explain the succession of events on any basis other than the liberation of a toxic substance from the uterus or placenta.

In pregnant patients with hypertension, the cold pressor test⁶ and response of the blood pressure to barbiturates⁷ have been suggested as aids in distinguishing between pre-eclampsia and hypertensive vascular disease. These tests have been successfully employed in selected cases. Recently, simultaneous ophthalmoscopic examination and cold pressor test have revealed angiospasm of retinal vessels. (See Table I.) In those patients exhibiting retinal angiospasm during the cold pressor test, a rise in diastolic blood pressure was a constant finding. The behavior of the systolic blood pressure in such cases is unreliable and probably unimportant. In a previous report⁷ renal suppression was obtained in hypertensive pregnant patients after prolonged immersion of the hand in ice water. It has been suggested that eclampsia, oliguria, anuria, and premature separation of the placenta complicating some hypertensions of pregnancy are due to angiospasm. Ophthalmoscopic examination and more attention to the response of the diastolic blood pressure may clarify the controversy regarding the diagnostic value of the cold pressor test.

Summary

1. External version in the presence of hypertension is not an entirely safe clinical procedure.
2. External version under anesthesia is dangerous.
3. The behavior of the blood pressure in the case reported suggests some liberated toxin as an etiologic factor in shock.
4. Evidence is advanced that angiospasm can be demonstrated in the fundi of hypertensive pregnant patients by use of the cold pressor test.

References

1. Adair, F. L.: Textbook of Obstetrics and Gynecology, Vol. II, Philadelphia, 1940, Lea and Febiger.
2. Newell, J. L.: *AM. J. OBST. AND GYNEC.* 42: 256, 1941.
3. Siegel, T. A., and McNally, H. B.: *AM. J. OBST. AND GYNEC.* 37: 86, 1939.
4. Goldenberg, T. H.: Thesis—Paris, 1932.
5. Casalta, E.: *Bull. Soc. gynéc. et d'obst.* 27: 73, 1938.
6. Dieckmann, W. J., Michel, H. L., and Woodruff, P. W.: *AM. J. OBST. AND GYNEC.* 36: 408, 1938.
7. Dieckmann, W. J.: *The Toxemias of Pregnancy*, St. Louis, 1941, The C. V. Mosby Company.
8. Alvarez, R. R.: *AM. J. OBST. AND GYNEC.* 39: 476, 1940.
9. Miller, D.: *Edinburgh M. J.* 49: 209, 1942.
10. Selinger, E.: *Am. J. of Ophth.* 20: 56, 1937.

PELVIC HEMATOMA COMPLICATING PARTURITION

WESLEY L. FURSTE, II, M.D.,* AND HERMAN W. KOERPER, M.D.,
COLUMBUS, OHIO

(From the Department of Obstetrics, College of Medicine, Ohio State University,
and The University Hospital)

THE following is an unusual case of pelvic hematoma complicating parturition.

(Hosp. No. 415,058.)—On July 1, 1941, Mrs. K. F., a 27-year-old housewife, was admitted in labor on the obstetric service of The University Hospital.

The family and past histories were essentially negative. The antepartum examinations revealed no unusual findings.

At about 5 A.M., July 1, 1941, this para 0, gravida i, due June 22, 1941, began to have labor pains. When she entered the hospital at 9:15 A.M., she was having contractions every 3 to 4 minutes. The temperature, pulse rate, and respiration rate were 98.4° 94, and 18 respectively. Physical examination revealed a well-developed, well-nourished, young, white woman at term in good health. The fetal heart, 140, was heard in the left lower quadrant. A slight amount of bloody, mucous show was visible. Rectal examination revealed the head at low station and the cervix to be 3½ fingers dilated. The total red count was 4.86 million; the hemoglobin was 16.4 Gm. (Sahli-Hellige method); the total white count was 12,400; and the differential white count was 74 per cent granulocytes and 26 per cent lymphocytes and monocytes. Urine examinations on entry and during the hospital stay were non-contributory.

By 11:20 A.M., the cervix was completely dilated. The membranes were ruptured artificially. At 11:34 A.M., a normal, living, female infant, weighing 4½ pounds, was delivered spontaneously with slight bleeding. One c.c. of pituitrin (obstetrical) was given. At 11:47 A.M., the placenta was expressed intact. One c.c. of ergotrate H, containing 1/320 grain, was given. A posterior vaginal wall first degree tear—¾ inch in length and just inside the mucocutaneous junction—was easily repaired with 20-day chromic catgut, size 0. At 12:15 P.M., the patient was returned to her room in good condition. Blood loss had been minimal.

At 6:30 P.M., the vulva was quite edematous. By 10 P.M., the patient had not voided; and was catheterized. At 1:15 A.M., ¼ grain of morphine sulfate was given for restlessness. At 3 A.M., the patient was awake; and complained of pain in her abdomen. Although the uterus felt fairly firm, massaging resulted in a large amount of bright red blood flowing from the vagina and in the expulsion of a medium-sized clot. At 3:15 A.M., the pulse rate was becoming more rapid, having risen to 112 from 92 at 3 A.M. An ice bag was applied to the abdomen. By 4 A.M., the bleeding from the vagina had ceased; the uterus was firm; the pulse rate had fallen to 100; and the patient was asleep. At 5:30 A.M., the

*First Lt. M. C., U. S. A., Camp Maxey, Tex.

pulse rate was again rising; but the fundus was firm. At 6 A.M., the pulse, weak and thready, was continuing to become faster; and the patient, apprehensive and breathing rapidly and shallowly, became pale, cold, and clammy. External heat in the form of warm water bottles and blankets were applied. At about 6:30 A.M., the blood pressure was zero.

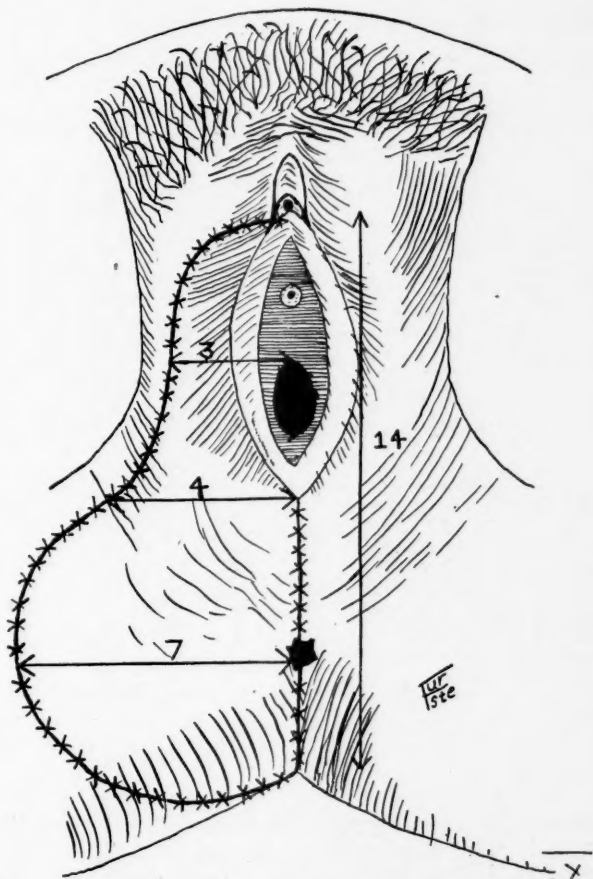


Fig. 1.—Extent of the visible portion of the hematomata. Numbers represent distances in cm. indicating the border of the visible portion of the hematoma.

Note that the hematomata were unilateral—being on the right side—and that the greatest visible extension was in the anal region where the outer border was 7 cm. from the anus.

The foot of the bed was elevated; more blankets and warm water bottles were placed over the extremities; and 1,000 c.c. of 10 per cent glucose in normal saline solution were administered intravenously. The pulse rate and blood pressure gradually decreased and increased respectively; the extremities became warmer; the amount of perspiring became less; and the breathing became slower, deeper, and easier.

After the shock was combated, the pulse rate fell from 100 at 8:30 A.M. to 72 at 10 P.M., and the blood pressure was steadily higher than 100/70. There became visible, however, large perineal hematomata.

From July 2 on, the post-partum period was uneventful, except for an elevation of the temperature to 102° and of the pulse rate to 110 on the fifth and sixth postdelivery days. On these two days, abdominal examination revealed a moderate, diffuse, right lower quadrant tenderness without muscle spasm; and rectal examination revealed, on the patient's right, a large mass of blood clots which measured at least 8 cm. in diameter, which extended up farther than the examining finger could reach, and which bulged markedly into the rectum and pushed it to the left. On the fourth of July, 9 grains of ferrous sulfate per day were started.

TABLE I. INCIDENCE OF PELVIC HEMATOMATA COMPLICATING PARTURITION ACCORDING TO DIFFERENT AUTHORS

AUTHOR	INCIDENCE
Michaels and Herring ⁶	1 per 5,474
DeLee ¹	1 per 4,000
Moschkow ⁷	1 per 1,951
Williams ⁹	1 per 1,500
	or
	1 per 2,000
Dorland ¹⁵	1 per 1,600

TABLE II. PROGNOSIS IN CASES OF PELVIC HEMATOMATA COMPLICATING PARTURITION

SOURCE OF DATA	NO. OF CASES	NO. OF DEATHS	PER CENT OF DEATHS
Cases described by Hamilton ³	12	1	8
Cases of others found by Hamilton ³ in the literature	115	26	23
Michaels and Herring ^{6*}	8	2	25
Goodhand ^{2*}	1	0	0
Lamm and Lamm ^{4*}	1	0	0
Lipow ^{5*}	1	0	0
Furste and Koerper (this report)*	1	0	0
All reports	139	29	21

Hamilton³ found 144 cases of 18 other writers^{1, 9-25}; but, for these cases, he was able to obtain complete data on only 115 which are mentioned in this Table.

*These cases were not reviewed by Hamilton.³

On discharge from the hospital on July 16, the total red cell count was 3.24 million; the hemoglobin was 10 Gm. (Sahli-Hellige method); the red cells appeared to be normocytic and normochromic; the total white count was 22,700; and the differential white count was 86 per cent neutrophils, 2 per cent eosinophils, 11 per cent lymphocytes, and 1 per cent monocytes.

On July 23, the skin color, produced by the perineal hematomata, was only a faint blue. Vagino-rectal examination revealed, about $\frac{1}{2}$ inch from the mucocutaneous junction on the right side of the posterior wall of the vagina, a somewhat tender, nonfluctuant mass, about 3 by 3 by $1\frac{1}{2}$ cm.; and did not reveal a mass in the broad ligament.

On June 10, 1942, the patient reported that, until about April, 1942, she had had slight pain on intercourse; but she had no other complaints. Vaginal examination revealed a slight cystocele, a uterus of normal size and shape and in an anterior position, and clear vaults without any palpable remainder of the hematomata. Likewise, rectal examination gave no indication of the previous hematomata.

References

1. DeLee, J. B.: *The Principles and Practice of Obstetrics*, 6 ed., Philadelphia, 1933, W. B. Saunders Co.
2. Goodhand, C. L.: *Bull. School Med. Univ. Maryland* **23**: 79, 1938-1939.
3. Hamilton, H. G.: *AM. J. OBST. & GYNEC.* **39**: 642, 1940.
4. Lamm, A. T., and Lamm, H.: *Texas State J. Med.* **38**: 276, 1942.
5. Lipow, E. G.: *AM. J. OBST. & GYNEC.* **42**: 1077, 1941.
6. Michaels, J. P., and Herring, J. S.: *New Orleans M. & S. J.* **95**: 37, 1942.
7. Moschkow, B. N.: *Monatschr. f. Geburtsh. u. Gynäk.* **92**: 421, 1932.
8. Schumann, E. A.: *A Textbook of Obstetrics*, Philadelphia, 1936, W. B. Saunders Co.
9. Williams, J. W.: *Obstetrics*, 6 ed., New York, 1930, D. Appleton-Century Co.

References cited by Hamilton³

10. Argonz, E.: *Rev. méd. del Rosario* **23**: 565, 1933.
11. Benedetti, I.: *Atti Soc. ital. di ostet. e ginec.* **34**: 224, 1938.
12. Coulin, R. F.: *Semana médica* **2**: 1676, 1929.
13. Danby, A. B.: *Proc. Roy. Soc. Med.* **17**: 20, 1924.
14. DeLee, J. B.: *The Principles and Practice of Obstetrics*, 4 ed., Philadelphia, 1927, W. B. Saunders Co.
15. Dorland, W. A. U.: *Manual of Obstetrics*, Philadelphia, 1896.
16. Frank-Kamenetsky: *J. Obst. & Gynaec. Brit. Emp.* **17**: 121, 1910.
17. Gibberd, S. F.: *Guy's Hosp. Rep.* **78**: 249, 1928.
18. Hirsch: *Monatschr. f. Geburtsh. u. Gynäk.* **31**: 1910.
19. Horvath, Z.: *Budapesti orvosí ujság* **36**: 577, 1938.
20. Morosoff, K. F.: *Vrach. gaz.* **34**: 1145, 1930.
21. Nervaex, F.: *Rev. méd. de Yucatán* **16**: 2, 1930.
22. Pio, G.: *Riv. d' ostet. et ginec. prat.* **20**: 329, 1939.
23. Polasek, F.: *Ceskoslov. gynaek.* **16**: 368, 1937.
24. Shaw, W. F.: *J. Obst. & Gynaec. Brit. Emp.* **31**: 651, 1924.
25. Van Vugt, D.: *Nederl. tijdschr. v. geneesk.* **77**: 3557, 1933.

Koller, T.: The Question of Thrombosis, *Schweiz. med. Wehnschr.* **72**: 1008, 1942.

As emphasized by Koller, women who are particularly susceptible to thrombosis and embolism are those who are over 40 years old, have borne children, are obese, have varicosities, somatic and psychic exhaustion, have had previous thrombosis or embolism, have febrile disease or have undergone an operative delivery or operation, and those with myomas or malignant tumors or postoperative complications.

The causes of thrombosis are physical-chemical-biologic changes in the blood, changes in the blood circulation, damage to tissue and meteorologic influences.

Prophylaxis of thrombosis and embolism consists of careful preoperative preparation, position after operation, sufficient fluid intake, bed exercises, the use of blood coagulants, early rising, stimulation of the heart and circulation—before and after operation, proper nourishment and scrupulous operative technique.

In the Zurich clinic the incidence of thrombosis and embolism was 1 per cent after spontaneous labor and 2.6 per cent after vaginal operative delivery. Among the latter, the frequency was 4.2 per cent for forceps delivery, 5.2 per cent for manual removal of the placenta, and 7.2 per cent for cesarean section.

J. P. GREENHILL.

SUBCUTANEOUS EMPHYSEMA COMPLICATING LABOR

DANIEL B. ROTH, M.D.,* FORT BENNING, GA.

(From the Surgical Service [Obstetrical Section], Station Hospital,
Fort Benning, Ga.)

THE occurrence of subcutaneous emphysema during or after labor is a rare and somewhat alarming complication. Its rarity is attested to by the fact that few men have seen it more than once in a lifetime of practice, and the total number of reported cases is only 156.

Simmons in London reported the first case in 1784,^{1, 6} but the occurrence of the condition is alluded to even earlier. Louise Bourgeois⁶ midwife to the Queen of France published in her "Observations" in 1617, "I saw that she tried to stop crying out, and I implored her not to stop for fear that her throat would swell." De Paul^{1, 6} in 1842 first drew attention to the condition, reporting a death and autopsy. Haultecoeur¹ in 1874 wrote the first thesis on the subject, collecting 13 cases. Since that time many new cases have appeared, Nicaisse¹ collected 54 in 1896, Kosmak⁷ 78 in 1904, Gordon⁶ 130 in 1927, Marony² 144 in 1933 and McCollum¹⁰ 151 in 1940. Since that time 5 more cases have been reported.

Report of a Case

The patient, Mrs. M. C., a 22-year-old white, para 0, gravida 1, was first seen in our clinic on September 28, 1942, 4 months pregnant. Her last menstrual period had begun on May 21, 1942, and lasted 5 days. The estimated date of confinement was February 28, 1943. Her previous history was entirely negative, except for urinary frequency of one year's duration.

Examination revealed a normal white female who was noted to be a hypothyroid type; her normal weight being about 180 pounds, and her height 63 inches. Measurements were adequate, intraspinous 27 cm., crests 28 cm., external conjugate 21½ cm., bi-ischial 8½ cm. The diagonal conjugate was not reached. The pelvis was of the gynecoid type and was felt to be ample. Blood pressure was 100/60 and the weight was 176. The height of the fundus was 17 cm. and the fetal heart was not heard. Wassermann report was negative, blood count was normal, showing red blood cells 4,240,000, white blood cells 7,250, hemoglobin 75 per cent (Tallquist). Polys 78, lymphs 22. Patient was put on calcium and ferrous sulfate. Pregnancy up to this time was uneventful except for slight nausea, vomiting, and frequency of urination.

The patient was next seen in clinic on November 9, 1942, at which time she had gained 9 pounds, blood pressure was 130/78, and she showed slight edema of the feet and hands. She was put on a restricted salt diet and told to return in two weeks. Patient was fairly well controlled during the remainder of her pregnancy, except for one small episode of elevated blood pressure (150/80) which responded to phenobarbital and rest. Patient was last seen in clinic on March 1, 1943, at which time the blood pressure was 120/60, weight 190, fundus measured 32 cm., position was ROA, and the fetal heart was heard in the right lower quadrant.

*Captain, Army Medical Corps.

Labor pains began at 2:00 A.M. March 2, 1943, and the patient was admitted to the hospital at 11:00 A.M. on this date. Examination revealed position ROA with the fetal heart audible in the right lower quadrant. On rectal examination the head was just above the spines, dilatation was one finger, and the cervix was thick. Pains were every 15 minutes and lasted for 30 seconds; contractions were not very severe. At 5:15 P.M. the membranes ruptured spontaneously and a heavy bloody show was noted. Examination at this time revealed dilatation to be three fingers, pains every 5 minutes lasting for 30 seconds, the head was just below the level of the spines and the position was ROA. Patient was given 3 gr. of seconal by rectum. At 6:25 P.M. patient was taken to the delivery room and at 7:00 P.M. delivered spontaneously of a living male infant. Right mediolateral episiotomy was done to facilitate delivery and this was repaired with subcutaneous 00 chromic catgut, with subcuticular closure of the skin. During the induction stage of the anesthetic (G. O. E.) the patient had a severe attack of vomiting, retching, and coughing; and gastric contents had to be aspirated by suction from the nose, mouth, and throat. After this the anesthesia proceeded smoothly.

Placenta was expressed intact and the blood loss was not excessive. The patient was returned to the ward in good condition. On reaction the patient complained of soreness in her throat and had a moderately severe cough. She was given codeine cough syrup 4 c.c. every 4 hours for this.

The first day after delivery it was noted that the patient's face was flushed and her respirations (24 per min.) were somewhat labored. Pulse was 96, temperature was 98.4° F. Râles were noted in the right posterior chest and there was slight suppression of the breath sounds. The next day x-ray revealed the presence of a bronchopneumonia of the right upper lobe, and an emphysema extending from the mediastinum up into the neck. The patient was complaining of difficulty in speaking and pain in the throat. Crepitus was noted in both supraclavicular areas and in the tissues of the upper chest wall, extending up to the angle of the jaw on both sides. Temperature was 101.2° F., pulse 128, respiration 30. The patient was flushed and perspiring freely, however, there was no cyanosis, and the patient did not appear to be overly distressed. Sulfathiazole was administered, Gm. II stat and Gm. I every 4 hours.

On March 5, temperature was 100.4° F., pulse 132, respiration 32, and the emphysema had spread up to the level of the ears on both sides. The neck pain and difficulty in speaking which she had experienced in the previous 2 days appeared much lessened. Patient's general condition was good and there was no evidence of cyanosis.

Sulfathiazole was discontinued on March 8 at which time temperature had been normal for 24 hours, pulse was 92, respirations 28. Blood sulfathiazole level was reported as 3.0 mg. per cent. Sputum examination showed no acid-fast organisms, but numerous gram-positive diplococci which did not type 1 to 33. Patient's general condition improved rapidly and the emphysema was completely gone, both clinically and by x-ray, on the 12th of March (tenth post-partum day). Patient was discharged from the hospital on March 17 at which time the chest was clear, the fundus well involuted and the perineum healed. When the patient was seen again in the clinic on April 9, 1943, the chest was clear and her general condition was excellent.

Summary

1. A case of subcutaneous emphysema associated with bronchopneumonia following labor and apparently resulting from severe retching and coughing during anesthesia is reported.

2. The emphysema in this case was probably due to rupture of overly distended pulmonary alveoli with leakage of air into the underlying pulmonic perivascular sheaths and passage by infiltration of the air along the sheaths to the mediastinum, from whence it followed the vessels of the trachea into the neck.

References

1. Faust, R. C.: Northwest Med. J. 39: 24, 1940.
2. Marony, J.: New England M. J. 205: 245, 1933.
3. McAllenon, H.: British M. J. 1: 764, 1935.
4. Nussbaum, F. H.: British M. J. 2: 1169, 1937.
5. Hulbert, H.: New York State M. J. 36: 468, 1936.
6. Gordon, C. A.: AM. J. OBST. AND GYNEC. 14: 633, 1927.
7. Charbonnet, P. N.: Subcutaneous Emphysema Following Labor, Surg., Gynec. and Obst. 40: 105, 1925.
8. Kosmak, G.: (Bull. Lying-In Hosp. N. Y. 3: 76-88) Surg., Gynec. and Obst. 40: 633, 1925.
9. Judge, A. F.: New York State M. J. 42: 1359, 1942.
10. McCollum, J. K.: J. Obst. and Gynaec. of Brit. Emp. 47: 309, 1940.
11. Macklin, C. C.: Arch. Int. Med. 64: 913, 1939.

PLACENTA ACCRETA

N. R. DAVIDSON, B.S., M.D., NEW ORLEANS, LA.

(From the Departments of Obstetrics and Gynecology, Flint-Goodridge Hospital)

CASE 1. In a Twin Pregnancy.—A young woman of 19, who was never curetted, never had any miscarriages nor operations of any kind, was being delivered by a midwife. Her first baby (boy) was delivered four hours before I was called in at the request of this midwife because she was unable to deliver the placenta. There was no hemorrhage. Upon external examination, a baby in the transverse position was diagnosed in utero. Fetal heart sounds were plainly heard.

The patient was immediately removed to the Flint-Goodridge Hospital where she was delivered of a second baby by an internal podalic version, in good condition. Attempts were made to deliver the placenta by expression, which failed; still there was no hemorrhage of any kind. After waiting for two hours the uterus was well contracted (an ampule of pitocin being given). Externally the fundus assumed a broad flattened shape instead of being rounded; traction on the cord showed no descent. Exploration under strict aseptic condition was done. There were two cords and two placentae adherent to the fundus with no line of demarcation whatever. No attempts were made to peel off the placentae. The patient was left alone until the next day: temperature 101.4° F. Ergotrate, grains 1/320 every four hours for four doses, was given. Infusion 1,500 c.c. 5 per cent glucose in saline were absorbed. The patient was typed for transfusion. Red cell count 3,750,000, white 10,600. Hb estimation 48 per cent. Urine negative.

Kahn, negative. After another attempt at trying to deliver the placenta had failed, the patient was prepared for hysterectomy. Since the status of the patient was that of a primarily infected case, a quick hysterectomy was done lasting 40 minutes, and 5 Gm. of sulfathiazole was placed in the cul-de-sac. Transfusion was given immediately, followed by two infusions of 1,000 c.c. 5 per cent glucose in saline two successive days following. The temperature rose to 102.6° F. the next day, then spiked for three successive days, following which it gradually subsided to normal after seven days. Patient was then discharged in three days in good condition.

Pathological Diagnosis: Double placenta accreta.

CASE 2. Associated With Rupture of the Uterus.—A well-nourished multipara was first treated 8/30/40 and was admitted for delivery, 9/6/40. She had had three normal deliveries prior to this. There was no hemorrhage nor retained placentas in her previous deliveries.

Blood pressure was 130/80, Wassermann negative. After approximately five hours of labor she was seized with sudden cramplike pains as though expulsion was imminent. She was placed on the delivery table for examination at which time the cervix was found to be dilated 2 cm. Within 10 minutes, there was profuse hemorrhage; the patient felt better but promptly went into shock. Coramine was administered and 1,000 c.c. 5 per cent glucose in saline as infusion was started; the patient seemed to rally and was removed to the operating room with a diagnosis of ruptured uterus. The presentation was vertex (O. R. A.). Fetal heart sounds were not audible and the mother was in poor condition from profuse hemorrhages which were continuing. She was immediately cross-matched. Laparotomy was performed. A high cesarean section was done; the baby (boy) was extracted and alive. Following this and in quick succession a supravaginal hysterectomy was accomplished but there was a rent in the right lateral aspect of the uterus at the site of the broad ligament and a large hematoma was enclosed in the ligament measuring approximately 3 by 3 inches in size and practically filling the right fornix. The patient still continued to bleed from this site. The ligament was opened, the hematoma removed and all bleeding points sutured with chromic catgut. The abdomen was closed in layers and 500 c.c. whole blood given. On the afternoon of the first day of operation the patient's temperature reached 102° F., the second day 103° F., the third day 102° F.; then the temperature spiked for 17 days ranging between 99° F. and 102.4° F. She had developed thrombophlebitis of the right leg. After 17 days the temperature remained normal, pain and edema of the leg subsided, and the patient was discharged with her baby seven days afterwards.

Pathological Diagnosis: Placenta accreta with rupture of the uterus.

UTERINE APOPLEXY FOLLOWING AN ELECTIVE SECOND CESAREAN SECTION*

STANLEY C. HALL, M.D., F.A.C.S., BROOKLYN, N. Y.

(From the Department of Obstetrics and Gynecology, Methodist Hospital)

THAT uteroplacental apoplexy is not an infrequent condition, is shown by the fact that in four years preceding the appearance of Williams' article in 1915, twenty such cases had been described and Portes was able to collect 73 cases in 1923. In 1921, Wilson reported a series of 69 cases, 46 of which were observed at laparotomy or autopsy. In 55 cases, in which something definite is said regarding the presence or absence of clinical evidence of toxemia, the condition of the patient indicated its absence in seven cases. There were 38 maternal deaths in the 69 cases—a mortality rate for the whole series of 55 per cent. The five babies which survived were all delivered by cesarean section.

The hypothesis which Wilson advances is that a hemorrhagic toxin is liberated by the placenta, which produces its maximum effect locally, and secondarily produces manifestations of a general toxemia.

The case of uterine apoplexy which I am reporting is unique for the following reasons: First, the uterine apoplexy followed an elective secondary cesarean section in a normal patient. Second, there was no evidence of any premature separation of the placenta, and a microscopic section from the placental site did not show hemorrhage.

Mrs. E. C., Grav. ii, para i, aged 31 years. Patient always well, except for appendectomy in 1938.

Her first pregnancy was in July, 1940. This was uneventful, except that the patient was due on June 20th, and did not enter the hospital until she was four weeks overdue, at which time she had a transverse presentation. A low classical cesarean section was performed under gas oxygen and ether. The baby was abnormal and lived only a few minutes. The post-partum x-ray diagnosis on the baby was achondroplasia. The autopsy diagnosis was chondrodystrophia fetalis.

The uterine bleeding at the time of the cesarean section was moderate and controlled by intrauterine pituitrin and intravenous ergotrate.

The patient became pregnant again in July, 1941, being due April 26, 1942. She had a normal blood pressure and urine throughout her prenatal course. She was admitted to the hospital on April 12th, two weeks before term because of pain in the lower abdomen. Examination at that time showed either a small incisional hernia or a very thin uterine scar, which was slightly tender. There were no uterine contractions, the uterus was soft, membranes intact, no vaginal bleeding, vertex presentation. The baby seemed to be average size.

Blood pressure was 110/84, temperature 98.4° F., pulse 88, urine negative, hemoglobin 85 per cent, 4,200,000 red cells. Patient was given morphine and blood taken for typing and an x-ray of the abdomen showed no abnormality of the fetus.

The morphine relieved the lower abdominal pain and there were no signs of labor or recurrence of pain.

A low classical secondary cesarean section was performed the next morning, under spinal anesthesia, using 15 mg. of pontocaine and 50

*Presented before the Associated Physicians of Long Island, at Methodist Hospital, January 30, 1943, and the Brooklyn Gynecological Society, March 5, 1943.

mg. of procaine. Indications for the section were a previous cesarean section, with a thin uterine scar.

Operation was as follows: The skin incision was excised. Several areas in the fascia had separated following the previous operation. The uterine scar was well healed except in one small area where it was less than a centimeter thick. The uterine incision was made in the region of the old scar. The membranes were ruptured at this time; a normal baby girl was extracted from an L.O.T. position, weighing 6 pounds 5 ounces. The uterus remained contracted and there was no bleeding until the placenta was removed and then only a moderate amount. One c.c. of pituitrin was injected into two different areas of the uterus. The uterus was closed and the incisional hernia repaired. Duration of the operation was 55 minutes.

During the closure, the anesthetist reported that the patient's blood pressure had dropped to 80/60 and that the pulse had increased to 140. The patient was given ephedrin and 500 c.c. of plasma and kept on the operating table for further observation. She continued to remain in a shocked condition and so continuous plasma with adrenal cortex was given and arrangements were made for a blood transfusion. The anesthetist did not feel that the condition was due to spinal shock, because of its delayed appearance and because the spinal anesthesia was wearing off and never did reach a high level. A medical consultation was obtained but no evidence of chest pathology was found. Frequent examination of the abdomen did not reveal any accumulation of fluid. The uterus seemed to be enlarging. There was normal post-partum vaginal bleeding—a small amount could be expressed from the uterus. There were no clots. About three hours later the patient was still on the operating table in a shocked condition, with a blood pressure of 60/40 and pulse of 140. The abdominal dressing was removed and found to be stained with serous sanguineous fluid, but there was no evidence of any hematoma of the wound or abdominal wall. Because of the continued shock and no improvement and the pallid appearance of the patient, it was decided there must be internal bleeding, so an exploration through the abdominal incision was performed. At this time, the blood pressure could not be obtained. There was no pulse and the heart rate was about 160. Continuous plasma and blood were being given. When the incision was opened there was considerable oozing from all surfaces. The peritoneal cavity contained a considerable amount of a thin bloody fluid and there was no evidence of bleeding from the intact uterine incision. At this point the patient vomited several ounces of bright red blood. The uterus was enlarged to more than twice normal post-partum size and was purple blue in color. The wall was soft and boggy and when at attempt was made to remove it through the abdominal incision, several holes were made in the posterior wall of the fundus with the examining fingers. These areas bled considerably. A diagnosis of uterine apoplexy was made and an immediate supercervical hysterectomy performed. There was considerable oozing from raw surfaces which was controlled with suture ligatures. The patient received altogether 1,750 c.c. of 25 per cent glucose, 7 c.c. of adrenal cortex solution. The patient was on the operating table from 9 A.M. to 5 P.M. that afternoon, at which time she was very much improved, with a blood pressure of 100/60 and a pulse of 120. She received another 500 c.c. of blood upon returning to her room. She had an uneventful recovery, being discharged home, with the baby, on the nineteenth postoperative day.

Examinations since have found her to be perfectly normal.

Gross Pathological Examination of the Placenta and Uterus

The placenta showed no pathology.

Examination of the uterus showed an incision 12 cm. long. The edges of the incision were closely approximated with sutures. No fluid or clotted blood was present in the wound. The entire serosal surface of the uterus was a deep purplish-blue in color. Throughout the uterus the myometrium was deep red in color and appeared to be extensively infiltrated with blood. There were a few small clots adherent to the placental site on the posterior surface of the uterus.

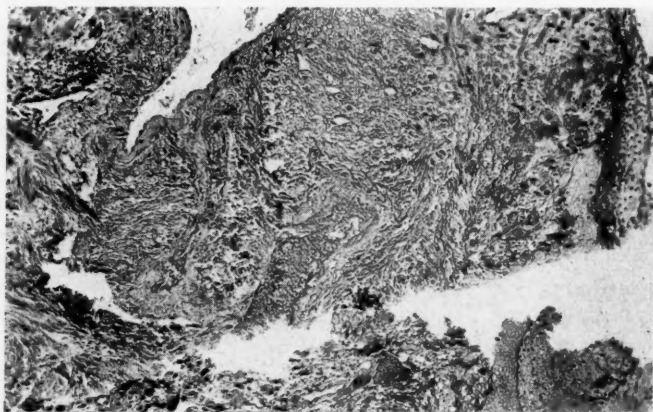


Fig. 1.—Placental site—Decidua and endometrium of pregnancy. Note absence of hemorrhage in myometrium. $\times 70$.

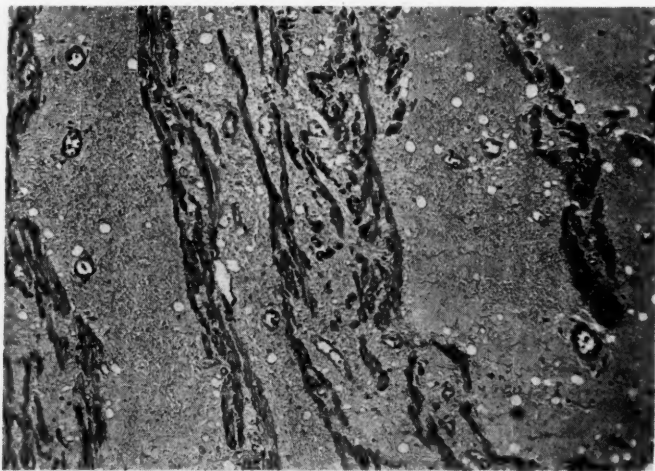


Fig. 2.—Section from outer uterine wall in the fundus. Muscle fibers widely separated by hemorrhage and edema. $\times 75$.

Microscopic examination of a section from the fundus showed muscle fibers hypertrophied and some degenerated. Single muscle fibers were separated from each other by edema and extravasated red blood cells. A section from the wall of the placental site showed a layer of blood on the inner surface, beneath this a thin zone of decidua and endome-

trium of pregnancy. The muscle fibers were hypertrophied. There was no blood in the myometrium of that area.

A section taken from the lower uterine segment showed edema and hemorrhage, but not as marked as at the fundus.

Pathological Diagnosis: Apoplexy of the uterus.

Comment

In reviewing, one case reported by Snowden showed bleeding from the abdominal incision for several days following a cesarean section in a case of uteroplacental apoplexy with nephritic toxemia.

There were numerous cases which had bleeding from other organs, and in some the intraperitoneal fluid was mostly of a serous nature.

Blood examination of the patient before and after the operation did not reveal any dyscrasia.

It seems that the uterine apoplexy in this case might have been caused by a placental toxin as described by Wilson, because of the bleeding from the abdominal incision, the vomiting of blood, the serous sanguineous fluid in the abdomen and the excessive bleeding at the time of the hysterectomy.

Conclusions

1. A review of the literature fails to reveal a similar case of uterine apoplexy.

2. This case report seems to bear out the theory that a hemorrhagic toxin may be responsible for uterine apoplexy and bleeding in other parts of the body.

3. Uterine apoplexy should be considered in patients going into marked shock following a cesarean section.

4. This case shows that a patient in extreme shock from uterine apoplexy with an unobtainable blood pressure, will withstand a hysterectomy if proper supplementary treatment is given by plasma and blood during the operation.

References

1. Stander, N. J.: Williams Obstetrics, ed. 8, New York, 1941, D. Appleton-Century Co., p. 1049.
2. Williams, J. W.: Surg., Gynec. and Obst. 21, No. 5: 541, 1915.
3. Lee, Gordon: J. Obst. & Gynaec. Brit. Emp. 28: 69, 1921.
4. Wilson, P.: Surg., Gynec. & Obst. 34: 57, 1922.
5. Snowden, E.: J.A.M.A. 36: 1066, 1921.
6. Portes, L.: Gynec. et Obst. 7: 56, 1923.

34 PROSPECT PARK WEST

CHORIONEPITHELIOMA WITH REGRESSION OF THE PRIMARY UTERINE TUMOR

MARK E. MAUN, M.D., AND WILLIAM M. GREEN, M.D., DETROIT, MICH.

(From the Department of Pathology, Wayne University College of Medicine, Detroit, Michigan; and from St. Joseph's Mercy Hospital, Pontiac, Michigan)

THE presence of a chorionepithelioma in extragenital organs without evidence of a primary lesion in the uterus has led to several theories regarding the origin of the tumor. Among these are: (1) The tumor represents a malignant teratoma; (2) the trophoblastic emboli occurring during normal pregnancy undergo malignant transformation; and (3) the primary tumor of the uterus completely regresses while the metastatic cells find more favorable growth conditions in distant organs. With a history of pregnancy the last theory would seem most reasonable, and the case reported here lends support to that contention.

Case Report

A 22-year-old white woman, a nullipara, delivered a normal male infant at term on May 28, 1942. The gestation and delivery were normal. The placenta was normal to gross examination, but it was not submitted to the laboratory for microscopic study. The patient's post-partum course was uneventful, and the patient was discharged from the hospital ten days following delivery. She was seen six weeks later for a routine post-partum examination. At that time she had no complaints, and pelvic examination revealed no abnormalities.

On August 26, 1942, the patient was admitted to the hospital because of complaints of progressive weakness, intermittent chills, and fever, all of which had been present for two weeks. On examination the temperature was 102.6° F., pulse 120, respirations 30, and blood pressure 118/68. A faint systolic murmur was heard at the apex. The lungs were clear. No abdominal masses could be palpated. Pelvic examination showed no abnormalities. Laboratory examinations showed the hemoglobin 9.5 Gm., red cell count 3,000,000, and white cells 12,800, of which 90 per cent were mature polymorphonuclear neutrophils. The urinary examination was essentially negative. The blood Kahn test was negative. Blood smears were examined for malarial parasites, but none were found. Agglutination tests for undulant fever, tularemia, typhoid fever, and paratyphoid fever were within the normal range. Repeated blood cultures showed no growth. X-ray examinations including a chest plate, a gall bladder series, and a flat plate of the abdomen showed no abnormalities.

During the first ten days in the hospital the patient had an elevated temperature with fluctuations between 99° F. and 104° F. Therapy at this time was entirely symptomatic, consisting of iron by mouth and blood transfusions. Since the patient improved gradually, she was discharged from the hospital on September 9, 1942.

She was readmitted to the hospital on September 20, 1942, because of increasing weakness and marked tenderness in the right upper quadrant. The only positive physical finding in addition to an elevation in temperature was tenderness in the right upper quadrant. The

liver could be palpated 5 cm. beneath the costal margin. Free fluid was present in the abdominal cavity. The hemoglobin was now 7 Gm., the white cells 15,000, and the neutrophils 78 per cent. The Friedman test was not done. The patient was again given blood transfusions, but she continued to fail rapidly and expired on September 25, 1942.



Fig. 1.—Metastatic tumors of the liver.

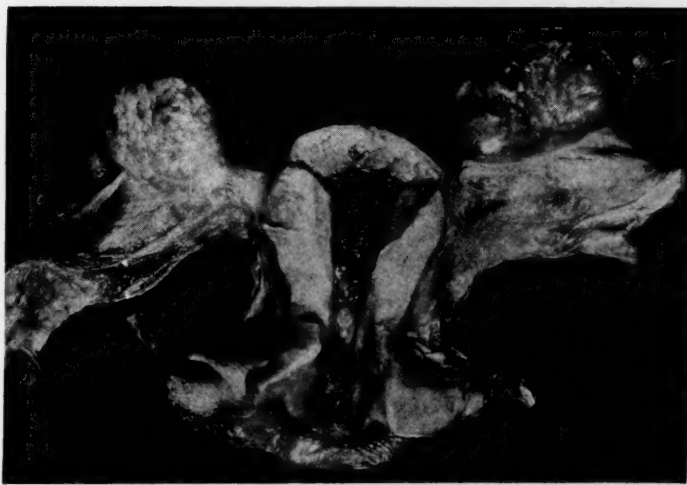


Fig. 2.—Uterus. Note hemorrhagic mass in the fundus.

Autopsy Examination.—The body was that of an adult white female measuring approximately 152 cm. in length and weighing about 100 pounds. There was no edema or jaundice. Opening of the abdomen revealed several thousand cubic centimeters of clotted and unclotted blood in the peritoneal cavity. The loops of bowel were smooth and shiny. The liver extended 5 cm. below the xyphoid and 4 cm. below the costal margin in the right anterior axillary line.

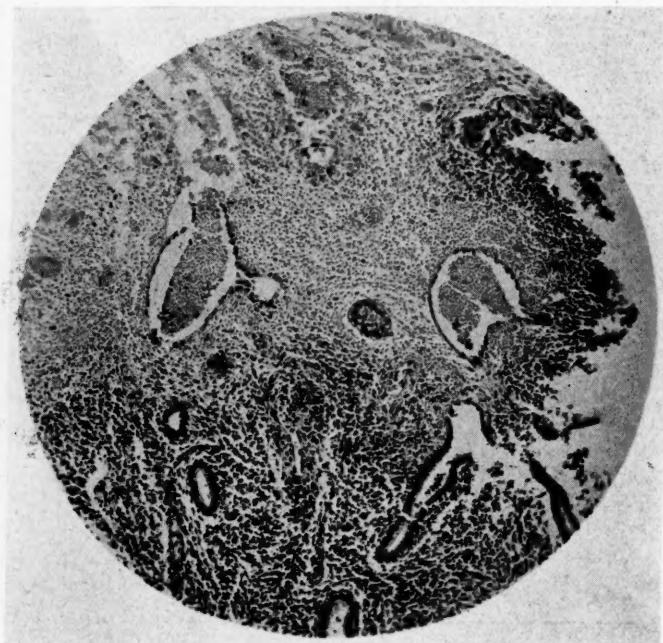


Fig. 3.—Section through the mass of uterine fundus. $\times 100$.

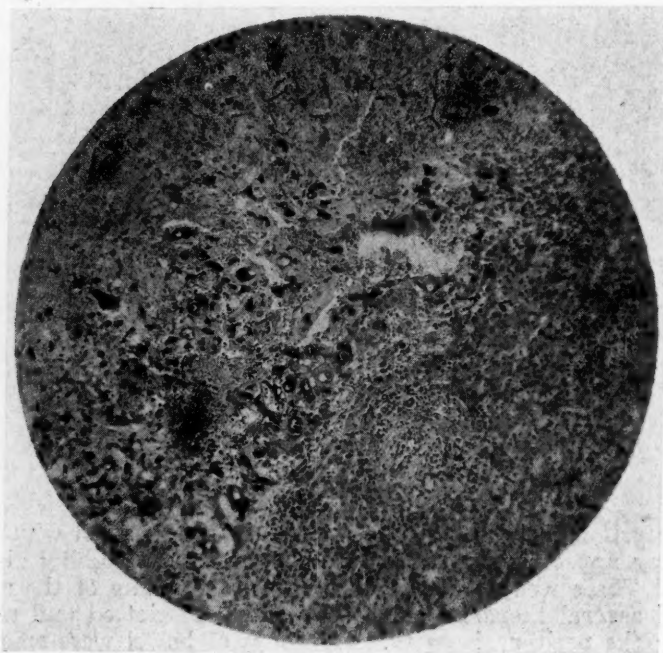


Fig. 4.—Section of tumor of the liver. $\times 100$.

Opening of the thorax revealed the right lung free, the left lung adherent by a few fibrous tags at the apex. The left pleural cavity contained a few cubic centimeters of blood; the right pleural cavity was empty. The pericardial sac was normal. The heart weighed approximately 300 Gm. The valves, the coronary arteries, and the myocardium were normal. The left lung weighed approximately 700 Gm.; crepitation was somewhat reduced throughout. A rather large amount of fluid exuded from the cut surface. No tumor nodules were seen. The right lung weighed approximately 500 Gm.; it presented a similar appearance.

The liver weighed approximately 2,500 Gm. A large tumor mass could be seen beneath the capsule of the right lobe, and several perforations of the capsule were present on the anterior surface; these measured several centimeters in diameter, and numerous blood clots were present in them. Examination of the cut section revealed the right lobe of the liver almost replaced by a very large tumor mass bulging from the cut surface and measuring 15 cm. in diameter. It was deep red in color, soft, and friable. The center was excavated and contained a large amount of blood. The tumor was sharply separated from the surrounding liver parenchyma. Several smaller similar nodules about 1.5 cm. in diameter were seen adjacent to the periphery of the tumor. The remainder of the liver was normal to gross examination. The empty gall bladder and the extrahepatic biliary ducts showed no abnormalities; nor did the spleen, the kidneys, the adrenals, and the pancreas.

The uterus measured 7.5 cm. in length and 4 cm. in its greatest diameter; its surface was smooth. The cervix was firm and white in color. A small amount of mucus exuded from the cervical os. Opening of the uterus revealed the endometrium to be thin, and the endometrial cavity to be normal in size. In the fundus there was a raised soft hemorrhagic mass measuring 2 cm. in diameter and 1 mm. in thickness. On palpation it was extremely soft in consistency and grossly did not appear to penetrate the uterine wall. The Fallopian tubes were normal in size. The broad ligament showed no abnormalities save for numerous thrombi which protruded from the cut vessels. The ovaries measured approximately 3.5 cm. in diameter; their surfaces were smooth and white save for several small cysts which bulged beneath the capsules. Examination of the cut surface revealed in each ovary a number of small cysts measuring 1 cm. in diameter. They were filled with clear fluid. The linings of these cysts were smooth.

The aorta was smooth throughout. The gastrointestinal tract showed no abnormalities. Permission for examination of the brain was not obtained.

Microscopic Findings.—Blocks of tissue were placed in 10 per cent formalin for fixation, embedded in paraffin, and the sections stained with hematoxylin and eosin.

Sections from the tumor mass of the liver revealed the central portion to be made up of necrotic material, fibrin, and large masses of free red blood corpuscles. The thin walls of the numerous vascular spaces coursing through the tumor were fairly well preserved. Only at the edge of the tumor could one identify viable trophoblastic cells; these showed marked pleomorphism. Most numerous were those with a spongelike, slightly eosinophilic cytoplasm and rounded vesicular nuclei containing coarse clumps of chromatin. Less common were cells

with a deeper-staining acidophilic cytoplasm and hyperchromatic nuclei irregular in shape but tending to take a spindle form. Numerous intermediate cellular types were found, and a few cells showed mitosis. Only after considerable search could multinucleated cells be found. The trophoblastic cells were found around and within the abundant vascular spaces present. Single cells could be seen in adjacent dilated sinuses or pushing into the hepatic cells. This invasive process produced atrophy and necrosis of the adjacent liver parenchyma. Here numerous leucocytes consisting of polymorphonuclear neutrophils, small lymphocytes, and plasma cells were found about the invading tumor cells. No teratomatous areas were seen in the numerous sections which were examined.

Numerous blocks were taken from the lungs, but careful search revealed no trophoblastic tissue. Unfortunately sections were not obtained from the parietal pleura. Several lymph nodes found adjacent to the aorta were normal. Examination of sections taken from the heart, the spleen, the adrenals, and the kidneys showed no abnormalities.

After fixation serial transverse sections about 1 mm. in thickness were made of the entire uterus, and the prepared sections were placed on slides in order that the entire uterine wall could be examined. Examination of the sections in approximately the midportion of the uterus showed the endometrium to be thin with only the basal layer preserved. It further showed a mild decidual reaction. The vessels of the uterine wall showed retrogressive changes with marked proliferation of the intima, narrowed irregular lumens, and a deposit of homogeneous hyaline material beneath the endothelium. Careful study of the vascular lumens and the entire uterine wall revealed no trophoblastic cells. The hemorrhagic mass seen on gross examination proved to be partially necrotized and contained shadows of decidual cells. Vessels containing viable red blood corpuscles and some endometrial glands were partially preserved. The hemorrhagic, seminecrotic mass replaced both the basal layer of the endometrium and the superficial portions of the muscularis. This mass undoubtedly represented the site of placental implantation which had undergone progressive necrosis and complete regression of trophoblastic tissue.

Sections taken from the round ligaments, the uterine tubes, and the broad ligaments were made at intervals of 5 mm. Examination revealed no trophoblastic tissue. The vessels of these structures contained numerous partially organized thrombi. Numerous sections of both ovaries were prepared for examination. A few of the cysts present were atretic follicles; in most of the cysts a thin strip of easily separated cells covered a nodular or uniformly thickened layer of cells showing luteinization. The cytoplasm of the latter group was vacuolated and stained faintly with eosin. The nuclei were dark-staining and usually rounded. These cells would seem to represent paralutein cells of the theca interna. A few small follicles showed a well-preserved granulosa layer, but none showed evidence of luteinization. Numerous corpora albicantia were seen in the ovarian stroma, but no decidual masses could be found.

Discussion

The genesis of extragenital chorionepitheliomas has provoked the interest of clinicians and pathologists. In a recent report Berman¹ summarized seventeen cases recorded in the literature as extragenital chorionepitheliomas on which autopsies had been performed. In most

of the cases a history of pregnancy was noted although the interval between pregnancy and death varied from months to years. It has been accepted that these tumors may represent a singular development in malignant teratomas, but the failure to demonstrate teratomatous elements casts doubt on the evidence.

Metastasis of chorionic tissue during normal pregnancy has been observed, and it has been suggested that such chorionic tissue may develop malignant tendencies. If this be true, one would expect to find chorionic tumors developing during the course of a normal pregnancy, and one might demonstrate multiple, somewhat uniform tumors in each lung. Such demonstrations are yet uncommon.

Novak and Koff² reported an instance in which the patient died of a metastatic chorionepithelioma, but at autopsy no trophoblastic tissue could be found in the uterus. They suggested that the primary tumor of the uterus had undergone regression while the metastatic portion had grown rapidly in other organs.

The uterine fundus in our case contained a small hemorrhagic mass but was free of chorionic tissue. This mass apparently represented abnormally retained placental tissue that may have served as the situs locum of the uterine tumor. Therefore, it is likely that the tumor of the liver in our case was metastatic in origin and that the primary uterine tumor completely regressed. The failure to find trophoblastic tissue in the uterine vessels or in the veins of the broad ligaments should not argue against the above thesis. Although this theory is based on incomplete evidence, there are few findings that would support alternate theories. If our patient had survived longer, it is probable that the uterus would have been normal while additional multiple metastatic tumors would have been present at death.

References

1. Berman, Lawrence: *Am. J. Cancer* 38: 23, 1940.
2. Novak, E., and Koff, A. K.: *AM. J. OBST. & GYNEC.* 20: 153, 1930.

Beruti, J. A.: Mortality During Pregnancy and the Puerperium: Its Frequency and Its Causes, *Arch. Clin. obst. y ginec., "Eliseo Cantón" 1: 573, 1942.*

Beruti believes that one-third of a million women die every year from childbirth throughout the world. In Argentina between 2,100 and 2,200 women die annually. At the Eliseo Cantón there were 61,684 births during the last 40 years. There were 821 maternal deaths of which 78.2 per cent were due to obstetric and 21.8 per cent to nonobstetric causes. The total maternal mortality rate was 13.3 per 1,000 births. However, while it was 22.1 per 1,000 from 1901 to 1910, it was only 5.6 per 1,000 from 1931 to 1940.

The author discusses the causes of death and emphasizes the dangers of toxemia, hemorrhage, trauma and infection.

J. P. GREENHILL.

ON THE USE OF THE WILLETT CLAMP FOR SCALP TRACTION IN DELIVERY

D. FRANK KALTREIDER, M.D., AND HUGH B. McNALLY, M.D.
BALTIMORE, Md.

(From the Department of Obstetrics, School of Medicine, University of Maryland)

IN JANUARY, 1941, one of us (H. B. McN.),¹³ published a preliminary report about the use of the scalp clamp in obstetrics, in which were presented 23 cases. Since then the scalp clamp has been used 71 times in the obstetric services of the University and Baltimore City Hospitals. This report concerns both series.

Willett first reported his experience with the fetal scalp clamp in 1925. He apparently did not follow up his original report. The number of reports has been small and sporadic with the majority in the foreign literature. The use of the clamp has never been very popular in this country, however, it is our opinion that it represents decided advantages in certain cases over other known methods and deserves a great deal more attention than it has received.

There has been a number of instruments devised for the purpose of scalp traction. Willett originally used a Mantel's forceps which was modified to the one which now bears his name. De Lee suggested a modification of the latter, but believed that an ordinary vulsellum or myoma forceps sufficed. Gauss devised an entirely new clamp. In this series a variety of these instruments was used largely as a matter of experimentation. In the majority of cases an ordinary hemorrhoid clamp proved quite satisfactory.

The forceps must have a fairly long handle and a T-shaped bite of sufficient width and firmness to insure a secure grasp. Serrated teeth may cause more serious and much more frequent scalp injuries, and they are not necessary to secure a firm bite into the scalp.

The technique is simple and may be used in the primigravida or the multigravida. When the membranes are ruptured (with the instrument itself, if desired) and the cervix is sufficiently dilated to allow for the introduction of the clamp, it is inserted under the guidance of the fingers and attached to the scalp of the fetus as near the occiput as possible. If the head is floating it may be necessary to exert pressure upon the fundus or lower uterine segment to maneuver the head into a position favorable for grasping. After it has been made secure there is attached to the clamp a tape or length of gauze which runs over a pulley at the edge of the bed and to which is fastened, in turn, a one-fourth to one-half pound weight that is held in suspension. This weight should not be greater than specified or heavy enough to cause damage on the maternal soft parts, but sufficient to hold the head against the lower uterine segment and thus irritate the uterus to greater activity. Although some writers claim that the instrument should be removed after 6 hours or after the head is engaged in the pelvis, it has been the authors' experience that it may remain safely in place until the second stage is completed, or a maximum of about 12 hours, the usual time of removal being when delivery was imminent.

We have used the scalp clamp in the following types of cases:

1. *Placenta Previa*.—It is used only in the marginal and partial types to tamponade the bleeding points as well as hasten labor by virtue of

the irritation of the lower uterine segment. This procedure offers a satisfactory substitute for cesarean section. It does not present the danger of infection of the Braxton Hicks bipolar version. The hydrostatic dilators frequently introduce infection and dislodge the presenting part, thereby increasing the possibility of prolapse of the cord or malpresentation. The clamp produces the desired results more efficiently and more simply.

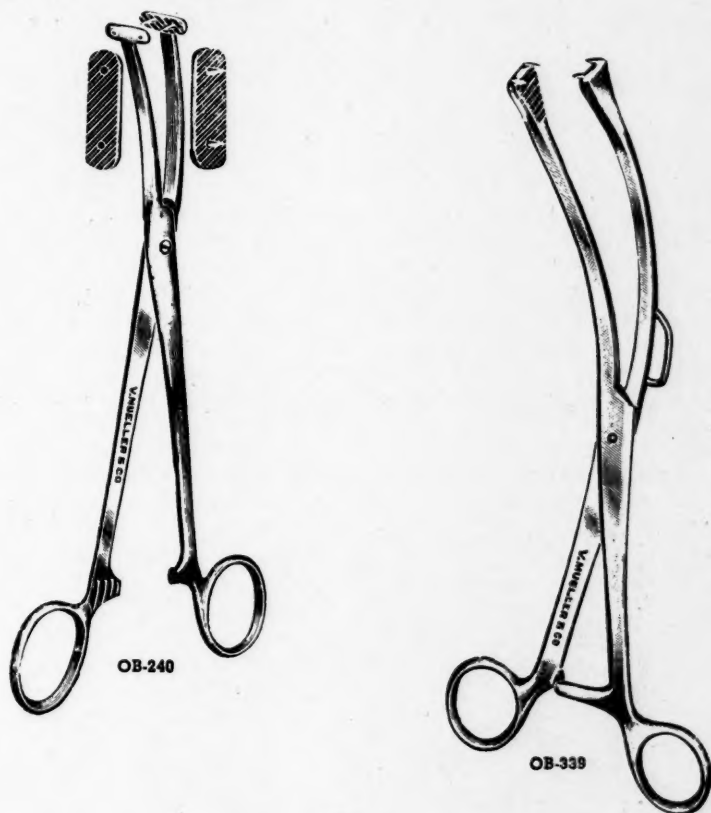


Fig. 1.

2. *Premature Separation of the Placenta.*—Particularly in the low implanted variety and in some selected cases of the normally implanted placenta. The mechanism is essentially the same as with placenta previa. The Spanish windlass probably should be reserved for a few selected cases in which hemorrhage is an outstanding feature, or in combination with the clamp.

3. *Uterine Inertia.*—It has been found that the traction force of this method brings the head in close contact with the lower uterine segment and stimulates the uterus to contract normally. This method removes, in many cases, the necessity for the administration of oxytocic drugs, some of which have the tendency to further tire the uterus, whereas the gentle direct mechanical stimulation does not force the uterus beyond its normal contractile capacity.

4. *Induction of Labor.*—The mechanism is the same as described for uterine inertia.

5. *Malpresentation of the Vertex.*—Such cases may be corrected by vaginal or combined manipulation and the attachment of the scalp clamp to a portion of the fetal scalp at or near the occiput. The traction will insure the permanency of the newly converted position and thus provide relief from possible dystocia caused by the positional disproportion.

6. It may be applied to the floating head when the membranes are ruptured to prevent the prolapse of the fetal parts or cord.

7. Finally, this method can be used in cases of known fetal death to hasten delivery when this is indicated. Craniotomy and forceful extraction of the child is certainly less desirable than scalp clamp traction with the relatively small amount of manipulation that is required. The latter method does not involve as much initial cervical dilatation, and does not injure the birth canal or subject the patient to as much risk of infection.

Table I presents the indications for which the scalp clamp was used in this series of 94 cases. Ante-partum and intrapartum hemorrhage was the indication in 45 cases. One of the cases of premature separation of a normal implanted placenta was of breech presentation which was treated by external version and the application of the clamp with subsequent control of the bleeding. The average blood loss before the application of the clamp was 296 c.c. (estimated). The average bleeding afterward was insignificant, less than 10 c.c. and in 34 cases there was none.

TABLE I. INDICATION OF THE USE OF THE CLAMP IN THIS SERIES

1. ANTE-PARTUM AND INTRAPARTUM HEMORRHAGE		45
a. Partial premature separation of low placenta	22	
b. Premature separation of normal implanted placenta	8	
c. Cause undetermined	6	
d. Marginal placenta previa	5	
e. Partial placenta previa	2	
f. Hemorrhage from amniotic sac	1	
g. Cervical erosion at term	1	
2. UTERINE INERTIA		25
3. INDUCTION OF LABOR		13
a. Hypertensive disease	3	
b. Eclampsia	2	
c. Fulminating pre-eclampsia	4	
d. Renal disease	1	
e. Hydrocephalus	1	
f. Floating head with membranes ruptured	1	
g. Dead fetus	1	
4. TRANSVERSE ARREST		6
5. MALPRESENTATION OF THE VERTEX, CORRECTED		5

In the next largest group, uterine inertia, the character of the pains, as well as the frequency was greatly improved in 22 cases. In the other 3 cases there was no change in the character.

In the cases of transverse arrest, the clamp was used entirely experimentally and we found that it had no effect whatsoever on proper rotation of the vertex. Four of these cases were manually rotated after full dilatation of the cervix.

The five cases of malpresentations were as follows: two were anterior face presentations that were converted to occiput posteriors, with excellent results. One was a military attitude that maintained flexion after correction. Two were compound presentations of the head and the hand and, after correction, continued on in labor normally.

In this series there were 33 primigravidas and 61 multigravidas. The average parity was 2.6.

The average duration of the latent period between the application of the clamp and the onset of labor in 38 cases was 1 hour and 24 minutes. The average duration of labor in these cases was 10 hours and 31 minutes. Of those already in labor, the average duration of labor before the application of the clamp in 56 cases was 34 hours and 40 minutes with the average cervical dilatation 4 cm. The number of cases which had prolonged labor, that is to say over 30 hours, in this latter group was 33. The average duration of labor in this group after the application of the clamp was 9 hours and 8 minutes.

The mode of delivery was as follows: Low or control forceps, thirty-one; midforceps with hysterostomy, five; midforceps alone, four. It should be stated that control forceps is a routine procedure in these clinics. Of the five midforceps with hysterostomy, one must be deemed a failure, two were definite cases of cephalopelvic disproportion, and two were cases of transverse arrest. Of the other four midforceps, two must be deemed failures while the other two again were cases of cephalopelvic disproportion. The three failures were with uterine inertia.

The membranes had ruptured spontaneously before the application in 30 cases, and an amniorhexis for induction had been done in 6 cases. In these 6 cases labor did not follow and the clamp was applied. In these 36 cases the total morbidity was 27.77 per cent. In the 58 cases in which the membranes were artificially ruptured at the time of application of the clamp, the morbidity was 27.58 per cent. Considering the complications that indicated the use of the scalp clamp, we do not think this figure is excessive. There were 4 cases in which there were febrile courses and complications other than birth canal. There was no maternal mortality.

The complications to the fetal scalp were as follows: cellulitis, 9, all survived: abscess of the scalp, 2, all survived: hematoma, 2, absorbed: laceration, 8, all healed.

There were 13 term stillbirths and 3 premature stillbirths, two term neonatal deaths and 8 premature neonatal deaths, a total of 26 deaths or a fetal mortality of 26.80 per cent. There were 25 premature births

TABLE II. STILLBIRTHS AND NEONATAL DEATHS

TERM STILLBIRTHS		13
Cephalopelvic disproportion	4	
Hypertensive disease, severe, maternal	2	
Macerated, cause unknown	2	
Prolapse cord and maceration	1	
Premature separation of normal implanted placenta	2	
Premature separation of low implanted placenta	1	
Hydrocephalus	1	
TERM NEONATAL DEATHS		2
Pneumonia, lobular; eclampsia, maternal	1	
Suprarenal hemorrhage, severe	1	
PREMATURE STILLBIRTHS		3
Premature separation of normally implanted placenta	2	
Prolapse of cord	1	
PREMATURE NEONATAL DEATHS		8
Premature separation of low implanted placenta	4	
Premature separation of normally implanted placenta	1	
Hemorrhagic disease (before vitamin K)	1	
Partial placenta previa	2	

and 3 sets of twins. This high fetal death rate is clarified in Table II. The four cases of cephalopelvic disproportion were in labor a long time before hospitalization. In the two cases of prolapse of the cord, the fetuses were already dead on admission to the hospital. In the cases of bleeding in which the children were either stillborn or died after birth, the average amount of blood loss was about 500 c.c.

Summary and Conclusions

1. The Willett clamp application to the fetal scalp offers definite advantages over other generally used methods of treatment in certain cases of placenta previa, premature separation of the placenta and uterine inertia. It is of definite value in the induction of labor, in the prevention of prolapse of the cord or of fetal parts, and in the maintenance of correction of malpresentations of the vertex.

2. Ninety-four cases are presented with 9 failures, 6 were experimental in transverse positions of the vertex, the final outcome consisting of 2 midforceps with hysterostotomy and 4 manual rotations with low forceps. There were 3 failures with uterine inertia. All three were delivered by midforceps, in one of which hysterostotomy was used.

3. This method has no particular value in the treatment of transverse positions of the vertex.

4. Risk to the baby is minimal.

References

1. Browne, F. J.: *Section Obst. and Gynec., Roy. Soc. Med.* Quoted From J. A. M. A. **113**: 1746, 1939.
2. De Lee, J. B.: *Principles and Practice of Obstetrics*, 7 ed., Philadelphia, 1938, W. B. Saunders Co., pp. 529, 1166.
3. Gauss, C. J.: *Arch. f. Gynäk.* **156**: 396, 1933.
4. Jennings, H. T.: *New Zealand M. J.* **31**: 220, 1932.
5. Kuhnel, P.: *Acta obst. et gynec. Scandinav.* **18**: 466, 1938. Quoted From De Lee and Greenhill: 1939 Year Book of Obstetrics and Gynecology, Year Book Publishers, Chicago, 1939.
6. Pannke, H.: *Zentralbl. f. Gynäk.* **61**: 2504, 1937.
7. Schehl, Ernest: *Zentralbl. f. Gynäk.* **61**: 8504, 1937.
8. Titus, P.: *Management of Obstetric Difficulties*, St. Louis, 1937, The C. V. Mosby Company, pp. 307, 393.
9. Vajna, Gabor: *Zentralbl. f. Gynäk.* **63**: 1350, 1939. Quoted from De Lee and Greenhill: 1939 Year Book of Obstetrics and Gynecology, Year Book Publishers, Chicago, 1939.
10. Vignies, H., and Tisserand, M.: *Gynéc. et obst.* **35**: 54, 1937.
11. Von Pall, G.: *Zentralbl. f. Gynäk.* **62**: 312, 1938.
12. Willet, J. A.: *Proc. Roy. Soc. Med.* **17**: Part 3, p. 90, 1925.
13. McNally, H. B.: *Bull. School Med. Univ. Maryland* **25**: No. 3, 175, 180, 1941.

AXIAL TORSION OF THE GRAVID UTERUS IN TWO SUCCESSIVE PREGNANCIES

JOSEPH E. CORR, M.D., F.A.C.S., NEW YORK, N. Y.

TORSION of the pregnant uterus is not a common occurrence but has been reported in a sufficient number of cases to make its diagnosis possible and yet, surprisingly, most diagnoses have been made at the operating or autopsy table. Physiologic rotation of the pregnant uterus has been seen at the time of cesarian section and torsion of the gravid uterus in cattle described first by Hippiaper Columbi in 1662, the predisposing cause being bicornuate uterus with its absent round and broad ligaments on one side, has been mentioned by Eastman¹ and others. In the human being torsion of the pregnant uterus has been described early in pregnancy due to mobilizing adhesions,² at term, in labor and in the post-partum period. Pathologic conditions of the uterus (fibromyomata) and interstitial pregnancy,³ and tumors of the ovary are in most instances believed to be the exciting cause but, as Vogel⁴ states "most writers emphasize the presence of ptosis with asthenia." The endopelvic fasciae and ligaments of the uterus in the normal healthy individual are capable of tremendous strain without allowing extreme degrees of rotation of the uterus in spite of such complicating pathology as tumors and adhesions. The asthenic type show nutritional defects in muscles and ligaments throughout the body as well as in those of the pelvic structures, so that, is it not fair to assume that postural changes, sudden straining, tumors, adhesions or interstitial pregnancy, may be the insult which carry through to a greater degree the physiologic rotation and then labor completes the axial torsion.

Rotation may be either to left or right, but most of the reported cases were clockwise and the degree of rotation has been from 90 to 360 degrees. Von Pall⁵ mentions Schweigl's reported case of pregnant myomatous uterus with torsion of 540 degrees in which the body of the uterus was necrotic.

The symptoms associated with torsion are dependent on the degree and the rapidity with which it occurs. Day⁶ in his review of the literature up to 1935 has in detail covered the symptoms of shock, abdominal pain and abnormal findings on examination and suggests that no attempt be made to reduce the torsion by external manipulation. However, he cites a case quoted to him by a colleague who was able to rotate a fibromyoma from right to left in a patient who was in labor, immediately relieving the patient's symptoms and allowing the labor to terminate spontaneously. This case alone should lead us to attempt replacing the uterus into normal position if the diagnosis is made, using anesthesia when possible. It is well, however, to remember that premature separation of the normally implanted placenta may be a concomitant finding, that rupture of the peritoneal covering of the uterus has been known to occur and that fatal embolism has resulted from detorsion.⁷ Certainly, if reduction is attempted gentleness should be the watchword with the patient prepared for cesarean section if the attempt results in failure.

It is impossible to propose any set procedure. The type of cesarean must be dependent on the pathology and in the patient here cited, in whom axial torsion occurred in each of her two pregnancies, the treatment had to be guided by many factors.

Mrs. A. W., 38 years of age, was first seen November 14, 1940, when she was approximately 16 weeks' pregnant. (Last menstrual period July 23, 1940; expected date of confinement April 30, 1941). She had married in April, 1940, had never consulted a physician "for any illness" previous to the pregnancy and her past history, menstrual history and course of this pregnancy were not remarkable, her usual weight being 130 pounds and height 67 inches. She was of the slim asthenic type and poorly nourished. Her blood pressure was 118/66, red blood count 3,820,000 and hemoglobin 68 per cent, white blood cells 7,600 with normal differential count, negative Kahn and Type O. The abdomen showed no scars and in spite of the fact that she was 16 weeks pregnant the fundus of the uterus was at the level of a 28 weeks' pregnancy and was nodular, palpation being easy through the thin abdominal wall. In the left side of the fundus a large soft fibroid could be palpated and its outline easily seen. No fetal heart could be heard, x-ray revealed no fetal skeleton and pelvis was the normal gynecoid type. Progress was normal, the fetal heart was constant in the right side and on April 22, 1941, the large fibroid in the left side of the fundus could be palpated protruding beneath the left rib margin. The vertex presented, was small, in midpelvis and ballotable. Her weight had increased to 149 pounds (19-pound gain), and there had been no complaints. Labor started on the night of April 24, 1941, at 8 P.M. She was admitted to the St. Vincent's Hospital at midnight and at 3 A.M. April 25, 1941, when the pains were recurring at 5-minute intervals, a rectal examination revealed the cervix to be thinning, 6 cm. dilated, vertex in right anterior position, fixed, small and at the level of the spines. Sedation was given with good results. A vaginal examination at 5 P.M. April 26, 1941, 21 hours after onset of labor revealed the head well above the spines, the cervix still 6 cm. dilated. The effect of the sedation had decreased, the patient had been more comfortable on her right side and two hours later the pains increased in intensity, became almost continuous and on rectal examination neither the head nor the cervix could be felt, the membranes being still intact. The abdomen was tense and tender and no shock was evident when one hour later cesarean was started. Torsion of the uterus was not considered but it was felt that because of the patient's age, the failure of progress in spite of strong pains, and the possibility of premature separation of the placenta, section was indicated. On opening the abdomen through a low median incision, 180 degrees axial rotation of the pregnant uterus was seen. The large intramural fibroid in the left side of the fundus was now in the right side beneath the liver, torsion having occurred through the lower segment of the uterus. The left round ligament could be followed obliquely from left to right, varicosities of the left broad ligament were markedly distended with blood and the posterior wall of the uterus, which presented in the wound, was deeply congested between the many small fibroids which studded it. The bladder was deep in the right side of the pelvis. Complete detorsion of the uterus was impossible, but with traction sutures after the incision had been extended above the umbilicus, reduction to approximately 90 degrees resulted. A longitudinal incision in front and parallel to the left broad ligament

allowed extraction of a 2,500-gram female child, meconium stained, which failed to breathe in spite of artificial resuscitation. The infant at birth was markedly cyanotic in the face, neck and extremities, with marked pallor of the chest and abdomen corresponding to the compression area. Autopsy was negative. The uterus contracted well and could be rotated to normal position after removal of the placenta which showed no evidence of premature separation. Moderate shock was evident, plasma and blood were given but the patient's condition made hysterectomy or myomectomy impossible. Eight grams of sulfanilamide crystals were sprinkled in the pelvis and suture line of the uterus and the abdomen closed. Convalescence was stormy for the first eight days, but thereafter was uneventful. The sutures were removed on the tenth day with primary union of the wound and the patient discharged on the sixteenth postoperative day.

Subsequent examinations at four- and six-week intervals showed the uterus to be about the size of a 16 weeks' pregnancy, nodular and movable. Her first menstrual period occurred on June 26, 1941, eight weeks post partum and although either myomectomy or hysterectomy was advised the patient refused because of her desire to have a child.

She was next seen June 3, 1942, again pregnant four months. Her periods had recurred regularly with normal flow and not accompanied by any discomfort. Her last menstrual period occurred on January 20, 1942; the expected date of confinement October 27, 1942. Blood examination, urine analysis and blood pressure were normal. The fundus on the left extended to the rib margin, on the right to the umbilicus. Myomectomy was suggested and refused and her progress was normal throughout the ante-partum period with regular examinations every two weeks up to the seventh month and weekly observations thereafter. The baby presented by the vertex, the fetal heart was regularly heard in the left lower quadrant and the fibroid in the fundus remained on the left side up to the visit of September 23, 1942, one month before term. From this date rotation of the uterus from left to right was gradual, the fetal heart moving from the left lower quadrant to the midline. The fibroid in the left moved toward the midline and could be felt in the right side. Notwithstanding the gradual torsion the patient experienced no discomfort. The patient was sectioned on October 21, 1942, one week before term, after failure at detorsion by external manipulation. Porro section or myomectomy was to be performed if her baby was normal. On opening the abdomen after excision of the scar, the pregnant uterus was seen in 90 degrees torsion, the uterus was incised just anterior to the broad ligament through the previous incision which was well healed and a 2,400-gram female child delivered. Examination of the infant revealed congenital absence of the roof of the mouth, including both the hard and soft palate. A small tab of tissue was noted between the upper and lower alveolar arches on the right side. The upper alveolar arch was very thick and there was marked hypoplasia of the mandible. The slitlike openings of the nasal canals were clearly visible. The child presented a severe feeding problem, developed bronchopneumonia and expired when 7 days old.

The report of the examination of the baby on delivery excluded all possibility of hysterectomy or myomectomy. Reluctantly the abdomen was closed, her convalescence was normal and she was discharged on her fourteenth postoperative day. When she was seen for final discharge the uterus was the size of a four months' pregnancy, her menstrual periods were normal and there were no complaints.

References

1. Eastman, Nicholson, J.: *Chinese M. J.* 48: 745, 1934.
2. Accivile, D.: *Ginecologia (Torino)* 7: 199, 1941.
3. Von Pall, G.: *Zentralbl. f. Gynäk.* 63: 2486, 1939.
4. Vogel, J.: *Zentralbl. f. Gynäk.* 64: 641, 1940.
5. Day, H. F.: *New England J. Med.* 213: 605, 1935.

130 EAST 67TH STREET

Beruti, J. A.: The Future of Forceps and the Forceps of the Future, Obst. y Ginec. Latino-Americanas 1: 10, 1943.

At the Eliseo Cantón in Buenos Aires, 35 per cent of all the operations performed during the last 40 years were forceps deliveries. In addition the incidence of internal version was 12.8 per cent, of abdominal cesarean section 4.7 per cent and of pelviotomy 3.9 per cent. The frequency of forceps operations decreased from 38 per cent in the decade 1921 to 1930 to 33.7 per cent during the years 1931 to 1937, whereas cesarean sections increased from 4.6 per cent to 11.4 per cent. The author maintains that the incidence of forceps delivery has decreased because of the greater use of cesarean section. He believes that in the near future vaginal operations will completely disappear. There is no perfect type of forceps and because of it the maternal and fetal mortalities are high. The author prefers the straight Zweifel forceps to any axis-traction forceps because by means of a uni- or bilateral episiotomy the birth canal is straightened out and there is no need for axis traction. To overcome the defects of the straight forceps the author has perfected a forceps which he calls "Polimorfo" and which can be used as a straight instrument for rotation and a curved one for extraction. He maintains, however, that the future for forceps is not promising and that we must try to find an instrument which is less dangerous to the mother and child.

J. P. GREENHILL.

Hawk, M. H., and Wangeman, C. P.: The Effects of Nembutal (Sodium Pentobarbital) and Scopolamine on Human Subjects, Anesthesiology 4: 238, 1943.

Nembutal (sodium pentobarbital) is a popular sedative with both the medical profession and the lay public. This drug has very definite stimulative and depressant qualities. In combination with morphine or scopolamine it exhibits these qualities in various ways. For example, the addition of scopolamine lessens the depressing effects of nembutal. "This is particularly true with respect to minute volume exchange of air to and from the lungs. There is less depression of the respiratory functions with nembutal than with morphine. The combination of nembutal and scopolamine causes less respiratory depression than that caused by morphine and scopolamine. The addition of scopolamine to nembutal provides a less profound, longer acting and more pleasant sedation than nembutal alone in spite of the apparent greater restlessness."

The combination of nembutal and scopolamine works very satisfactorily and is recommended for preoperative sedation. It is an excellent inhibitor of mucous secretion. It is not recommended as a pain reliever.

HARVEY B. MATTHEWS.

Editorial

Precision Methods in Cephalometry and Pelvimetry

THE recent publication of a simple method of cephalometry and pelvimetry* suggests speculation in a subject in which the fields of roentgenology and of obstetrics are intimately related and interested. Dr. Cave, author of this article, presents, as have many roentgenologists before him, another precision method which is, no doubt, quite accurate and claims to eliminate the human factor in estimating the distance of the object from the film. The method is a modification of one recorded by Portes and Blanche in 1924. Exposures are made with the same centering but with different known tube-film distances. The resultant film images are measured and applied in a special formula which gives the actual length of the diameter under consideration. In pelvimetry the author claims that it can be employed to any transverse diameter of the inlet or outlet. However, it should be emphasized that with this method of pelvic mensuration, as well as with others, unless contour studies of the pelvis are combined, the greatest usefulness of roentgenography to clinical obstetrics will be overlooked.

In considering any precision methods of roentgen pelvimetry, we should not forget just exactly what they mean. They simply represent the relationships of the bones of the pelvis to each other at the moment the roentgenogram was made. The obstetrician in evaluating such exact information nevertheless must realize that not only does pregnancy itself influence those relationships but the "positioning" of the patient incident to the taking of the roentgenogram also may exert a certain influence. Studies of the influence of pregnancy on the pelvic articulations are well established, while the effect of posture to cause changes in pelvic relationships is also well known. It is true that such influences probably have but minor effects, but they are present nevertheless. Precision methods of roentgen pelvimetry therefore may be accurate as far as a single roentgenogram is concerned, but they must be evaluated clinically to be essentially useful. It seems reasonable to conclude that any dimension of the bony pelvic canal which is accurate to 0.5 centimeters should be satisfactory and clinically useful.

In considering the great advantages to be offered by roentgen pelvic investigation we must not forget that from the clinical point of view, unless contour studies of the bony pelvic structure are combined with mensural information, the greatest usefulness of such studies will not be obtained.

*Cave, Paul: *Brit. M. J.*, August 14, 1943, p. 196.

Therefore, in considering evidence offered by roentgenography, the obstetrician must have in mind not only what the bony pelvis looks like but he should know something of the so-called "normal" variations of this structure. That these variations may have a definite influence on the course of labor has become established largely through the contributions of our American investigators. We should again remind those working in roentgenologic fields that if methods of pelvimetry are complicated and the interpretation largely in the hands of the roentgenologist, the usefulness of the information so obtained is going to be limited and the whole subject of roentgen pelvimetry become somewhat mystifying to the obstetrician. Unless films can be viewed and evaluated by the obstetrician himself, and unless he alone is to be responsible for the solution of his clinical problems, conflicts will arise which will impede the essential usefulness of the greatly valuable knowledge which roentgenography is now able to offer.

HERBERT THOMS, M.D.

Department of Statistics

A SURVEY OF ABORTION DEATHS IN PHILADELPHIA FROM 1931 TO 1940 INCLUSIVE*

HENRY J. SANGMEISTER, M.D., F.A.C.S., PHILADELPHIA, PA.

ON MAY 23, 1934, Williams¹ reported on a "Survey and Analysis of Maternal Mortality in Philadelphia" covering 717 deaths occurring in 1931, 1932 and 1933. In the three years there were 26 nonseptic abortion deaths and 162 septic abortion deaths or a ratio of one to six. This study of 450 cases incorporates all the cases from 1931, and is a continuation of Dr. Williams' report on nonseptic and septic abortions up to and including the year 1940.

In Philadelphia, all maternal deaths are analyzed by a maternal mortality committee which determines whether the death is nonpreventable or preventable on the part of the physician or the patient. Bringing into an open discussion the causes which contributed to the patient's death has made every Philadelphia physician doing maternity work, obstetric conscious, resulting in better obstetrics, so that today the puerperal mortality rate in our city has dropped from 6.0 per thousand live births in 1931 to 2.3 in 1940.

TABLE I. PUERPERAL MORTALITY RATE FOR A TEN-YEAR PERIOD

YEAR	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
Rate*	6.0	6.5	4.5	5.3	4.9	5.3	3.8	3.1	2.8	2.3

(*Per 1,000 Live Births).

Each case is thoroughly investigated, the attending physician is urged to attend the meeting and give his version of the case. While this postgraduate study tends to better obstetrics, in so far as reducing puerperal mortality, in abortion deaths there is the uncontrollable factor of self-induction or of having another person induce the abortion.

TABLE II. PERCENTAGE OF ABORTIONS AND PERCENTAGE OF PUERPERAL DEATHS

	TOTAL	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
Nonseptic abortion	37	10	11	3	1	5	2	1	0	2	2
Septic abortion	413	63	55	42	52	46	48	47	19	19	22
Percentage abortion deaths		29.4	27.6	29.6	32.3	32.7	28.7	41.0	19.2	24.4	31.6
Percentage of puerperal deaths		70.6	72.4	70.4	67.7	67.3	71.3	59.0	80.8	75.6	68.4

The term "abortion" is applied to cases of a nonviable fetus, that is, one of under 28 weeks of pregnancy. Over the ten-year period 1931 to 1940 inclusive, there were 450 abortion deaths, 37 cases being nonseptic and 413 cases septic, or a ratio of 1 to 11.6. In 1931 and 1932, the peak years, there were ten and eleven deaths respectively in the nonseptic group and 63 and 55 deaths respectively in the septic group; from then on there has been a gradual decline in both groups, to such an extent that the low point was reached in 1938, when there were no nonseptic deaths and in the septic cases the years 1938 and 1939 showed nineteen deaths in each year. While this is an improvement, still the abortion mortality is high as shown in the year 1937, when abortion took a toll

*Presented at a Meeting of the Obstetrical Society of Philadelphia, May 6, 1943.

of forty-eight lives or 41 per cent of the total puerperal deaths. It will be noted that the percentage of abortion deaths every year is roughly about the same, approximately 29 per cent, except in the years 1937, 1938 and 1939.

Abortion, both septic and nonseptic, in the ten years, caused a 25 per cent mortality of all puerperal deaths. There were 279 nonobstetric deaths during this decade, so, if these cases are deducted, the corrected mortality of abortion deaths in Philadelphia between 1931 and 1940 inclusive is 29.8 per cent of all puerperal deaths. In terms of births, there were 318,103 deliveries in Philadelphia both live and stillborn during the ten-year period, so that the ratio of abortion deaths is 11 per thousand total births.

TABLE III. NONSEPTIC ABORTIONS

	TOTAL	PRIMIPARA		MULTIPARA	
		MARRIED	SINGLE	MARRIED	SINGLE
Spontaneous	26	6	0	20	0
Induced	8	2	2	4	0
Therapeutic	2	0	0	2	0
Operative	1	1	0	0	0
Totals	37	9	2	26	0

In the nonseptic group of 37 cases, 35 were married and two single, the ages ranging from 23 to 46 years of age in the married group and in the single cases, there were only two, one 24 years of age and colored, the other 33 years old and white. Reduced to percentages, 94 per cent occurred in married women. There were 32 white women and five colored. There were 26 spontaneous abortions, six were primiparas and twenty multiparas, all married. Eight women induced the abortion on themselves or had someone person do it for them, four were primiparas, two married and two single, and four multiparas, married. There were two therapeutic abortions in multipara and one operative case in a married primipara with a mistaken diagnosis of ectopic pregnancy, who died on the operating table evidently from a pulmonary embolus.

The principal cause of death in this group was hemorrhage representing 23 cases or 62.2 per cent. In the septic group all cases hemorrhaged, indeed to such an extent that 31 cases were moribund on admission to the hospital.

There were fifteen abortion deaths complicated with other diseases.

TABLE IV. ABORTIONS COMPLICATED WITH OTHER DISEASES

Pneumonia	6 cases
Influenza	1 case
Pulmonary embolism	1 case
Hemorrhagic infarct following abortion	1 case
Cardiovascular disease	3 cases
Cardiac dilatation and ergot poisoning	1 case
Gastric hemorrhage	1 case
Hydatidiform mole (under hemorrhage deaths)	1 case

Pneumonia complicating abortions offers a grave prognosis. In the six cases the interval between birth and death of the mother occurred:

Three days in an early abortion,
Six days in an early abortion,
One and one-half hours in a three months' pregnancy,
Six days in a three months' pregnancy,
Eight hours and 20 minutes in a three and one-half months' pregnancy,
Five minutes in a six months' pregnancy, and
Seven days in a case of influenza.

The majority of the abortions, 239 cases or 53 per cent in both the septic and nonseptic groups, occurred within the first three and one-half months of preg-

nancy. Between three and one-half months and six months there were 76 cases. One hundred and thirty-five cases were classified as undetermined, but by the histories, we feel over one half of these can be placed within the first three and one-half months of pregnancy.

There were two therapeutic abortions. One a case of cardiorenal disease, the other a case of chronic nephritis both associated with hypertension. The Committee decided one case was nonpreventable, the other preventable on the part of the physician, due to an error in judgment.

The Committee determined that sixteen deaths in the nonseptic group were nonpreventable, twelve deaths preventable on the part of the patient and nine on the part of the physician. Five of these nine deaths were due to hemorrhage and could have been saved by combating shock and restoring blood volume before proceeding to evacuate the uterus.

TABLE V. SEPTIC ABORTIONS

	TOTAL	SPONTANEOUS		INDUCED		THERAPEUTIC	
		PRIMIP- ARA	MULTIP- ARA	PRIMIP- ARA	MULTIP- ARA	PRIMIP- ARA	MULTIP- ARA
Married	299	34	31	76	151	1	6
Single	97	9	3	78	7	0	0
Divorced	6	2	2	2	0	0	0
Widow	9	0	3	5	1	0	0
Separated	2	0	1	0	1	0	0
Total	413	45	40	161	160	1	6
		85		321		7	

Septic abortion over the ten-year period caused 413 deaths. There were 45 spontaneous abortions in primiparas, 161 induced and one therapeutic abortion. In the multipara, there were 40 spontaneous abortions, 160 induced and six therapeutic. Three hundred and eleven women were white and 102 colored, the white outnumbering the colored by more than 3 to 1. Briscoe², in a ten-year analysis of puerperal sepsis in Philadelphia from 1931 to 1940, found a similar ratio of 3.2 to 1.

Williams, in his three-year study of abortion deaths in Philadelphia 1931 to 1933, pointed out that "one of the outstanding facts about this survey is that 22.5 per cent or over one-fifth of the total deaths studied (162 of the total 717 puerperal deaths) were caused by septic abortion." Seven years later, we can report for the ten-year period 1931 to 1940, that there is no improvement, the death rate from septic abortion being 27.3 per cent (413 of the total of 1,511 puerperal deaths) or one abortion death in every 3.6 puerperal death.

TABLE VI. ABORTION WITHOUT SEPSIS

1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
10	11	3	1	5	2	1	0	2	2
TOTAL 30 cases or 81%					TOTAL 7 cases or 19%				
ABORTION WITH SEPSIS									
1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
63	55	42	52	46	48	47	19	19	22
TOTAL 258 cases or 62.5%					TOTAL 155 cases or 37.5%				
(AVERAGE 71.5%)					(AVERAGE 28.5%)				

In seeking a cause for this increase, we are impressed with the fact that 81 per cent, or 30 cases, occurred in the nonseptic abortions in the first five years 1931 to 1935 inclusive, and that 62.5 per cent or 258 cases occurred in the septic group in the same period of time. In the second five-year period, from 1936 to 1940 there were 19 per cent or seven cases in the nonseptic group, and 38 per

cent or 155 cases in the septic group. In other words, abortion both septic and nonseptic occurred in 71.5 per cent during the first five-year period, compared with 28.5 per cent during the second five-year period. We feel that the financial depression was a predisposing factor in causing the increase during the first five-year period.

In this study of septic cases, there were 299 married women, 97 single women, nine widows, six divorcees and two separated, or a similar ratio of almost three married women to one illegitimately pregnant. The number of induced abortions irrespective of wedlock outnumbered the spontaneous abortions by almost four to one. There were 321 induced abortions, 85 spontaneous abortions and seven therapeutic.

Many of these septic cases were treated with sulfathiazole. We prefer sulfanilamide to any of the other sulfonamides in these infected cases, and give it early as soon as the patient develops a fever. We feel many physicians have been weaned away from sulfanilamide due to the associated cyanosis and various toxic reactions which occasionally occur. However, in septic abortions we feel none of the other sulfonamides can take the place of sulfanilamide. The cyanosis in these cases is due to methemoglobin, which can be promptly reduced from a blood level of 30 to 40 per cent to less than 4 per cent in 30 minutes by giving intravenously methylene blue 0.1 to 0.2 c.c. of a 1 per cent solution per kilo body weight. This can be repeated in 8 hours. We have for years been giving by mouth 5 gr. of methylene blue three times a day at the start of sulfanilamide treatment which effectively combats the cyanosis.^{3, 4}

There were seven therapeutic abortions, three cases of toxemia associated with hypertension, one case of placenta previa, one case of heart disease, one case of bleeding in a threatened abortion sixteen weeks pregnant, and one case of pyelitis. Including the two nonseptic therapeutic abortions, the committee decided of the nine cases, two were nonpreventable and seven preventable on the part of the physician.

TABLE VII. PREVENTABILITY

	DEATHS · NONSEPTIC	SEPTIC	PERCENTAGE
Nonpreventable	64	16	14%
Preventable on the part of the patient	332	320	73.7%
Preventable on the part of the physician	54	45	12%

In the whole group of 450 cases, 14 per cent were nonpreventable, 73.7 per cent were preventable on the part of the patient and 12 per cent preventable on the part of the physician. Under nonpreventable deaths are classified spontaneous abortions, the result of an unavoidable accident or cases complicated with other intercurrent diseases. Preventability on the part of the patient was due usually to self-induction or having someone induce the abortion for her, or lack of prenatal care. Preventability on the part of the physician was due, either to an error in judgment or error in technique. We feel that, in a city with five medical schools, a twelve per cent preventability factor on the part of the physician is too high.

Summary

1. Four hundred and fifty cases of abortion deaths occurred in Philadelphia during a ten-year period between 1931 and 1940; 37 cases were nonseptic and 413 cases septic, or a ratio of one to 11.6.

2. Abortion deaths represent 29.8 per cent of all puerperal deaths during this decade or in terms of total births, eleven per ten thousand total births.

3. Hemorrhage was the principal cause of death in the nonseptic group, representing 62.2 per cent. In the septic group, while all cases hemorrhaged and 31 cases were admitted to the hospital in a moribund condition, the chief cause of death was sepsis which included such terms as septic endometritis, peritonitis, septicemia, etc.

4. In this study, the death rate from septic abortion is 27.3 per cent or one abortion death in every 3.6 puerperal death.

5. In the septic cases, the ratio of married women to those illegitimately pregnant is about three to one. Induced abortions, irrespective of wedlock, outnumbered the spontaneous abortions by almost four to one.

6. Sulfanilamide should be the drug of choice in septic abortion. Anoxemia can be effectively combated with methylene blue.

Acknowledgments

I wish to thank the Maternal Mortality Committee of The Philadelphia County Medical Society for the privilege of having access to the records for the past ten years, and I wish especially to express my thanks to Miss Dorothy Malkiel, Statistician for the Philadelphia County Medical Society, whose untiring help made this study possible.

References

1. Williams, Philip F., M.D.: Maternal Mortality in Philadelphia 1931 to 1940. Report of the Committee on Maternal Welfare.
2. Briscoe, Clarence P.: A Ten-Year Analysis of Puerperal Sepsis Deaths in Philadelphia, *AM. J. OBST. & GYNEC.* 48: 144, 1943.
3. Hartman, A. F., Perley, A. M., and Barnett, H. L.: *J. Clin. Investigation* 17: 699, 1938.
4. Wendell, W. B.: Correspondence, *J. A. M. A.* 109: 1216, 1937.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

A METHOD FOR CATALOGUING DATA FROM RECORDS OF MATERNAL DEATH

CHARLES A. GORDON, M.D., AND ALEXANDER H. ROSENTHAL, M.D.,
BROOKLYN, N. Y.

*(From the Committee on Maternal Welfare of the Medical Society of the
County of Kings)*

THROUGHOUT the United States, committees engaged in critical analysis of local experience have been accumulating case records which contain valuable information as to the actual causes of maternal death. The worth of these records grows with the years. Of obvious value for statistical comparisons, their content may be made the source of material for closer examination and perhaps publication.

The Committee on Maternal Welfare of the Medical Society of the County of Kings has in its files several hundred records in which the controllable factors in maternal death have been well developed, without identification of patient, physician or hospital. It is important to keep an accurate record of the results of committee discussions, yet it is unwise to record this information in the form of detailed minutes. Legal inquiry into the physician's responsibility for death may bring about unpleasant situations.

We have devised a very satisfactory method for the continuous compilation of data by attaching to each case record two multigraphed sheets as shown in Table I and Table II. One entitled "Data on Case History" contains all the historical data worthy of note. The other shows the primary and secondary causes of death, as agreed upon by the committee, as well as the controllable factors concerned. Both these sheets are checked, during or directly after a meeting of the committee, and the causes of death, which need not coincide with official coding, are written.

Later, each item is posted on its own proper card, which will be found in one of three files marked "Historical Data, Controllable Factors or Causes of Death"; the notation includes three numbers, the first two identifying the case and the hospital where death occurred, and the third the principal cause of death assigned (Table III). The following case will illustrate this:

A white primipara was admitted to the hospital in active labor at term. Her prenatal course was good. After 12 hours the cervix was fully dilated, the vertex was found in L.O.A. position, and within an hour the caput could be seen. Under gas-oxygen-ether anesthesia, episiotomy was performed, and a 7-pound living fetus was delivered by forceps. Ten minutes later bleeding occurred. Unsuccessful efforts to express the placenta were followed by more profuse bleeding. A consultant thereupon packed the uterus with the placenta in situ. Hemorrhage continued for two hours, and the patient's condition becoming progressively worse, she was given an infusion of 1,000 c.c. of 5 per cent glucose. The uterine pack was then removed and the placenta expressed quickly by Crédé. Profuse hemorrhage followed and she died 20 minutes later. Various cardiorespiratory stimulants had been given prior to death.

TABLE I. DATA ON CASE HISTORY

Primipara	White	Puerperal death
Multipara	Colored	Nonpuerperal death
Home delivery	Illegitimate	Poor prenatal care
Home death	Midwife delivery	Post-mortem delivery
Ambulance delivery	Midwife care	Undelivered
Ablatio placentae	Contracted pelvis	Missed abortion
Abortion	Diabetes	Mole
Acute nephritis	Eclampsia	Obesity
Acute yellow atrophy	Ectopic	Pelvic tumor
Anemia	Essential hypertension	Poliomyelitis
Appendicitis	Fibroid	Postmaturity
Bronchopneumonia	Hydramnios	Previa
Carcinoma	Hydrocephalus	Prolapsed cord
Cardiac	Hyperemesis	Psychosis
Cerebral hemorrhage	Influenza	Pyelonephritis
Cervical scar	Large fetus	Syphilis
Cholecystitis	Lobar pneumonia	Tuberculosis
Chorioepithelioma	Long labor	Thyroid
Chronic nephritis	Miscellaneous*	Toxemia
Contagious disease		
(Previous operation)	Fixation uterus	Previous x-ray
Amputation of cervix	Myomectomy	Vaginal plastic
Cesarean section		
Occiput posterior	Breech	Face
Transverse presentation	Multiple pregnancy	Precipitate labor
Artificial rupture of membranes	Hysterotomy	Posterior position
Bag	Induction of labor	Postmortem section
Breech extraction	Manual dilatation of cervix	Spinal anesthesia
Cesarean	Manual removal placenta	Spontaneous delivery
Dilatation and curettage	Mutilating operation	Sterilization
Dührsen forceps	Myomectomy	Uterine pack
Forceps	Porro	Vaginal pack
		Version
Anuria	Laceration cervix	Sepsis, nonoperative
Dilated stomach	Laceration vagina	Sepsis, operative
Embolism	Paralytic ileus	Shock, nonoperative
Gas bacillus infection	Peritonitis	Shock, operative
Hemorrhage	Phlebitis	Separated symphysis
Inversion uterus	Rupture of uterus—probable	Transfusion reaction
Intestinal obstruction	Rupture of uterus—proved	Upper respiration infection
Stillbirth	Neonatal death	Autopsy

*Checked for any unusual complication or associated disease and the complication or disease written beneath and on the file card marked "Miscellaneous."

The committee assigned this death to post-partum hemorrhage. It was agreed that manual removal of the placenta should have been carried out, and that blood transfusion, not intravenous glucose solution or cardiorespiratory stimulants, should have been given. Table I was therefore checked for primipara, white, puerperal death, forceps, uterine pack and hemorrhage. Table II was checked for intravenous fluid, packing, retained whole placenta and transfusion, after post-partum hemorrhage was written as the primary cause of death.

All our cases have been catalogued in this way, so that it is now possible to review any subject. If, for example, we wish to know the part played by inadequate or no transfusion in our mortality statistics, the transfusion card in the controllable factors file would tell us the total number of cases, principal causes of death, and the num-

TABLE II. CAUSES OF DEATH

PRIMARY	-----
SECONDARY	-----

CONTROLLABLE FACTORS	
Abortion, induced	Long labor
Abortion, self-induced	Midwife
Abortion, therapeutic	Operation, choice of
Abortion, unknown	Operation, time of
Accouchement forcé	Packing
Analgesia	Patient
Anesthesia	Pituitrin
Asepsis	Placenta, retained part
Bag induction	Placenta, retained whole
Bougie induction	Pregnancy
Breech extraction	Prenatal care
Cervix	Previous surgery
Cesarean section	Rupture membranes
Diagnosis	Shock therapy
Episiotomy	Syphilis
Forceps	Traction on cord
Hospitalization	Transfusion
Incidental surgery	Treatment
Intravenous fluid	Version
Large fetus	

TABLE III. PLACENTA PREVIA

*C 52—34—149 ¹	-----	-----
D 13—22—148 ³	-----	-----
etc.		

*Note that each case is indicated by three notations. The first, C 52, represents the individual case and in our system the letter "C" stands for the year 1939. The second number, 34, is the hospital. The third, 149¹ is the principal cause of death.

ber of cases annually, since each identifying number includes a letter which indicates the year. Case records may then be withdrawn from the files for detailed information. In the same way, the frequency of prenatal complications associated diseases, operative procedures, or any other factor in which the obstetrician may be interested may be quickly discovered. Yearly summaries and comparisons, which we once found difficult and time consuming can now be prepared with ease.

1313 BEDFORD AVENUE

Society Transactions

PHILADELPHIA OBSTETRICAL SOCIETY

MEETING OF MAY 6, 1943

The following papers were presented:

- A Survey of Abortion Deaths in Philadelphia From 1931 to 1940 Inclusive.** Henry J. Sangmeister, M.D. (For original article, see page 755.)
- Further Observations on the Use of Low-Dosage Irradiation in Dysfunctional Menstrual Disorders.** Charles Mazer, M.D., and Rose Greenberg, M.D. (by invitation). (For original article, see page 648.)
- Constitutional Inadequacy in Women: Gynecological Aspect.** Edward A. Schumann, M.D.
-

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF APRIL 16, 1943

Case Report:

- Full-Term Abdominal Pregnancy.** Alfred J. Kobak, M.D. (Published in the October issue, page 577.)

The following paper was presented:

- Carcinoma of the Cervix. Consideration of Certain Factors Pertaining to Its Control.** Norman F. Miller, M.D., Ann Arbor, Mich. (For original article, see page 625.)
-

Erratum

In title of the article, "The Effect of Complementing the Diet in Pregnancy With Calcium, Phosphorus, Iron, and Vitamins A and D," by Fred L. Adair, M.D., William J. Dieckmann, M.D., Herbert Michel, M.D., Florence Dunkle, M.S., Sylvia Kramer, Ph.D., and Edna Lorang, B.S., Chicago, Ill., which appeared in the July issue, page 116, should have read:

*"The Calcium, Phosphorus, Iron and Nitrogen Balance
in Pregnant Women."*

Department of Reviews and Abstracts

Selected Abstracts

Analgesia and Anesthesia

Rucker, Edwin: *Intravenous Anesthesia in Obstetrics*, Virginia M. Monthly 70: 35, 1943.

Sodium pentothal has been used by the author in 106 obstetric patients. No attempt was made to select the cases for intravenous anesthesia though at first it was given timidly to patients who had received heavy sedation during labor. This is now thought to be of no importance. Fetal apnea was encountered rarely. Using a 2.5 per cent solution of sodium pentothal, the average dose was 625 mg. The greatest dose was 1,500 mg. and the smallest 75 mg. The drug was administered after full dilatation of the cervix and the patient then prepared for delivery. A perineal nerve block with 1 per cent proctine was done and the intravenous injection was discontinued as the head was being delivered.

For dilatation and curettage sodium pentothal was used following atropine hypodermically and in cesarean section it was administered just before opening the uterus and continued until the uterine incision was closed, the rest of the operation being performed under local procaine infiltration. It is advisable to administer oxygen constantly and the patient's airway must be maintained. Two fetal deaths occurred in this group, the first a four and one-quarter pound twin from a toxic mother. The second fetus was dead on admission to the hospital. There was no maternal mortality.

WILLIAM BICKERS

Figueiredo, Ivan deOliveira, and Centola, Amadeu Ludovico: *Intrapartum Perineal Anesthesia in Primiparas*, Rev. méd. munic. (Rio de Janeiro) 3: 509, 1942.

De Oliveira Figueiredo and Ludovico Centola carried out perineal anesthetics during the expulsive stage in a series of 117 primiparas. The technique used was based on DeLee's method of infiltration of the perineum for episiotomy.

The results obtained in the present series indicate that perineal infiltration, although not abolishing completely the pain produced by distention of the vagina, vulva and perineum during the expulsive stage, diminishes it materially. It also facilitates the common measures for protection of the perineum against laceration. If episiotomy becomes necessary, it can be performed easily, although in a great number of cases the authors achieved perineal relaxation they do not claim success in all cases. Among the present series were 17 elderly primiparas with four lacerations, an incidence of 23.5 per cent. In a comparable series of nonanesthetized elderly primiparas the percentage of perineal lacerations was 44.4 per cent. The average duration of labor following anesthesia was 27 minutes in both the young

and elderly primiparas. The method was used in two cases of breech delivery without a perineal tear; in 11 cases of low forceps delivery with success in nine, and in one case of embryotomy, likewise with success. The total incidence of perineal lacerations among the 117 cases was 17.3 per cent as compared with 49 per cent in a series of 100 nonanesthetized primiparas. The use of perineal infiltration anesthesia is recommended in primiparas, multiparas with intact perineum, in cases of eclampsia, in women who exhibit fear and in cases of breech presentation.

J. P. GREENHILL

Calvo, J. A.: Fifteen Hundred Fifty Cases of Obstetric Anesthesia With Intravenous Evipan Sodium, Arch. Clin. Obst. y Ginec. Eliseo Cantón 1: 291, 1942.

J. A. Calvo finds that the use of this anesthetic during labor is harmless for the woman when there are no contraindications. The technique is simple and requires no expensive or complicated apparatus and there is no danger of explosion. It hardly influences the uterine contractions, sometimes increasing the interval between them; it does not oppose the action of posterior pituitary lobe extracts. Of all the drugs used to obtain painless labor, evipan sodium has probably the lowest deleterious action on the fetus; it is practically harmless when used intravenously and in fractionated doses. The toxic doses are far removed from the anesthetic doses, and the extremely rapid elimination of evipan makes it an indirectly controllable anesthetic. By following an appropriate technique and associating it with sedatives during the period of dilatation, painless labor can be obtained during expulsion in 98 per cent of the cases, whether primiparas or multiparas. The method should be used only in clinics and hospitals, so that it may be controlled by a competent and experienced personnel. The drug does not cause any late complications in mother or child. It produces sleep and amnesia in an agreeable manner. Waking is rapid and is not followed by vomiting or any ill feeling. Its cost is relatively low; it can be kept indefinitely. Compared with all the other drugs used to relieve pain during labor and expulsion, it is the least toxic and the easiest to administer.

J. P. GREENHILL

Leon, Juan: Obstetrical Analgesia: Barbiturate Twilight Sleep in Labor, With Special Study of Sodium Pentobarbital, Arch. Clin. Obst. y Ginec. Eliseo Cantón 1: 101, 1942.

Juan Leon states that sodium pentobarbital alone or in combination is not the ideal analgesic, as it fails in 22.8 per cent of the cases unless dangerously high doses are used. It acts much better as an amnesic than as an analgesic. Its soporific power is high: it produces deep sleep in 80 and somnolence in 20 per cent of the cases, but causes strong excitement in 6.7 and slight excitement in 25.2 per cent. Temporary vomiting occurred in 10.9 per cent. Careful observation of the uterine dynamics showed that in most cases the drug has no pernicious influence on labor. The progress of dilatation is decreased in 2.3 per cent, but is accelerated in 72.9 per cent. Suppression of cervical spasm is the greatest advantage offered by the barbiturates. The expulsive stage is of normal length in primiparas and multiparas, and the number of interventions is decreased. The frequency of perineal lacerations (24.7 per cent) is due to the difficulty of protecting the perineum in agitated women. Placental delivery is undisturbed. Despite infractions of the rules of asepsis which inevitably occur with agitated patients, puerperal infection is rare, but unfortunately respiratory complications are not exceptional. There was no maternal mortality, while the noncorrected stillbirths amounted to 0.47 per cent and the corrected percentage was zero.

The advantages of sodium pentobarbital and its combinations are relative simplicity of the method, low cost, high percentage of amnesia, practically absolute harmlessness for the mother, absence of disturbances of labor, less influence on the child than with other drugs. Its disadvantages are impossibility of stopping its effects, low analgesic power, excitement of the patient and numerous personnel required so that the method can only be used in specially organized clinics.

J. P. GREENHILL

Malignancies

Kamniker, Hellmut: Genital Carcinoma in Young Women, Wien. Med. Wchnschr. 89: 415, 1939.

The author reviews a total of 2,277 cases of genital carcinoma which had been seen at the University Woman's Clinic in Vienna between the years 1921 and 1933. All of the patients had been observed carefully and the survivals followed for at least 5 years. The author's series is first broken into 1,744 primary cases of carcinoma of the genital tract and 523 cases of recurrent carcinoma. He proceeds then to discuss the results observed from treatment of carcinoma among the younger age group, of 30 years or less and compares this series with the patients in a second series, aged 31 to 35 years.

Among 1,199 cases of carcinoma of the cervix there were 42 patients, 20 to 30 years of age, 3 of this group were between 20 to 25 years of age, and 18 cases were pronounced cured and without evidence of metastases after 5 years, an absolute cure of 45 per cent. There were 80 women having carcinoma of the cervix in the 31- to 35-year age group and 32 of these patients were pronounced cured after a 5-year follow-up, hence 50 cures from among 122 cases, 41 per cent, between the ages 20 to 35 years.

The 1,199 cases of carcinoma of the cervix were graded clinically, viz.: 631 cases, 53 per cent, Groups I and II; 568 cases, 47 per cent, Groups III and IV. Kamniker states that but 12 of the 42 cases, aged 30 years or less, were included among the clinical Groups III and IV, while 30 cases, 71 per cent, fell into the clinical Groups I and II. In the total series there were 72 per cent 5-year cures among Group I; 43 per cent among Group II and 15 per cent among Group III in contrast to the younger aged group which revealed 73 per cent, 5-year cures, among Group I; 42 per cent, among the Group II and 22 per cent among Group III. Twenty-nine of the younger group underwent radical panhysterectomy (Schauta's Operation), and 20 of these patients survived 5 years or longer; one case remained permanently cured with but a cervical amputation (a Group I case), while the remaining 13 cases were treated with radiation therapy with but a single case reaching a "permanent cure."

There were 115 cases of fundal and 63 cases of vaginal carcinoma. Among these two groups there were no patients below 30 years of age. There were 157 cases of ovarian neoplasm among which were 2 cases under 20 years of age; 3 between 21 to 25 years and 5 cases between the ages of 26 to 30 years. Among these 10 younger women two were pronounced "permanently cured."

The author concludes that carcinoma in the younger person is no more malignant than carcinoma among the older. He states that radical surgery should not be withheld because of a patient's youth and that it is, . . . "better to have a living female with a very short vagina than a dead patient." The permanent cures are much better in the younger aged group, 45 per cent, in contrast to 17 per cent 5-year survival among his series of 156 cases over the age of 60 years, for the latter present poorer operative risks and are subject to a greater incidence of intercurrent infection.

CLAIRE E. FOLSOME

Pearson, Bjarne, M.D., and Garcia, Manuel, M.D.: Spread and Metastasis in Carcinoma of the Cervix Uteri, New Orleans M. & S. J. 95: 215, 1942.

A study of 74 cases of carcinoma of the cervix coming to autopsy has been reported with the purpose of observing carefully the routes of spread in order that a more accurate and effective method of irradiation might be found. In 32.7 per cent there was extension to the vagina; in this group there was extension along the recto-vaginal septum in 17.3 per cent and the vesicovaginal septum in 8.6 per cent. There was ureteral constriction with hydronephrosis in 65 per cent of the cases and this is described as the most common cause of death; uremia being the terminal event. Intestinal obstruction occurred in 12.1 per cent and was the cause of death in 6.7 per cent. Distant metastases were present in 25.7 per cent of the cases and were found most commonly in the liver, lung, pleura, and peritoneum. It is pointed out that local spread occurs predominantly in the lateral direction, but that spread in the sagittal planes, anteriorly and posteriorly, is frequent and presents methods of irradiation which are not effective in their prevention.

WILLIAM BICKERS

Buess, H.: A Case of Perforation of a Carcinomatous Malformed Uterus, Monatschr. f. Geburtsh. u. Gynäk. 113: 260, 1942.

The author describes a case of a double uterus in which an adenocarcinoma was present in one horn. Perforation took place in the involved horn.

J. P. GREENHILL

Simeon T. Cantril, M.D., and Franz Buschke, M.D.: Carcinoma of the Cervical Stump, Western J. Surg. 50: 454, 1942.

Carcinoma of the cervical stump made up 6 per cent of the total cervical carcinomas seen by the authors. Approximately 1 per cent of all cervixes left after subtotal hysterectomy developed carcinoma. The patients with stump carcinoma are seen earlier than those with other cervical malignancy and approximately 50 per cent are stage I and II. This is the reverse of the distribution of carcinoma of the cervix uncomplicated by previous subtotal hysterectomy. The treatment of the stump lesion is more difficult and hazardous to the patient. Radium can rarely be placed in the cervical canal because of shortening and one must rely upon proper distribution of the radium tandem in the vaginal vault plus deep x-ray treatment. The author employed a minimum of 4,000 mg. hours plus 10,000 roentgens through six portals. The incidence of proctitis and cystitis is therefore much higher following this treatment of stump carcinoma. In one case with a cauliflower growth, the treatment was intravaginal roentgentherapy followed by radium.

The subtotal versus the total hysterectomy is considered and the author feels that subtotal hysterectomy is a justifiable procedure only after cervical malignancy has been ruled out by careful examination of the cervix and biopsy of the endocervix. In all chronic lacerated cervixes the procedure of choice is total hysterectomy. Attention is called to the fact that one-third of cervical carcinomas begin high in the endocervix not visible by speculum examination.

WILLIAM BICKERS

Simpson, Burton T., M.D., Thibaudeau, Alphonse A., M.D., and Burke, Eugene M., B.S.: Adenocarcinoma of the Cervix, New York State J. Med. 42: 767, 1942.

The authors present a study of 63 examples of adenocarcinoma of the cervix treated at the New York State Institute for Malignant Disease. In their series the age incidence was found to approach more nearly the age incidence of carcinoma of the body of the uterus, 34 per cent of the patients being over 60 years of age, 31 per cent of these women were nulliparas. Treatment was by radiation therapy.

In considering the prognosis, due attention must be given to both the histologic grade of malignancy, as well as to the clinical extent of the disease. The best results were obtained in Grades I or II in which the lesion was limited to the cervix. Forty-six per cent of the patients in this classification were living and well after five years. In the entire series there were 38 per cent of five-year cures.

One case of mucoid adenocarcinoma of the cervix is included which has remained well for 14 years following therapy.

KARL M. WILSON

Gynecological Operations

Leon, Juan: Histologic Changes Produced in the Genital and Other Organs by Electrotomy. Bol. Soc. de obst. y ginec. de Buenos Aires 21: 198, 1942.

Histologic changes produced in the genital and other organs by electrotomy with Hyam's conization electrode were studied experimentally by Leon. One rabbit and two dogs were used in these studies. The pathologic changes in the uterus varied according to the tissue obtained by conization. The most prominent changes in the myometrium were tumefaction, homogenization and definite tendency to basophilia of the collagenous substance, whereas the smooth muscle fibers suffered mere stretching of their bodies and nuclei, their staining properties remaining unchanged. These lesions disappeared rather abruptly with the margins of the thin scar produced by conization. The walls of the arterioles included in the peripheral zone of coagulation showed alterations ranging from mere stretching of the muscle fibers to complete homogenization of the entire wall into one amorphous basophilic mass. The glandular and epithelial elements of the mucosa, on the other hand, were affected to a much greater extent than the connective and muscular tissue in the myometrium for the alterations were observed in areas subjacent to the zone of coagulation. The most outstanding feature was elongation of epithelial cells and their nuclei in a direction parallel to that of the electric current. In extreme cases the nuclei appeared as elongated rods in palisade-like arrangement. Similar connective tissue and epithelial changes as in the uterus were observed in the vagina, bladder, kidney, breast, liver, striated muscle, etc., the only variable factor being the peculiarity of the local epithelium. In general, the zone of coagulation did not surpass the extent of 600 to 800 microns in thickness. This almost lineal line of destruction no doubt assures primary union of the wound margins. However, contrary to the contention of others, Leon believes that the epithelial changes are irreversible.

J. P. GREENHILL

Bazan, Julio, and Althabe, Omar: The Fothergill Operation in the Treatment of Genital Prolapse. Bol. Soc. de obst. y ginec. de Buenos Aires 21: 268, 1942.

The Fothergill operation in the treatment of genital prolapse is discussed by Bazan and Althabe on the basis of 354 observations. This method affords the possibility of correcting utero vaginal prolapses and the accompanying retroversion of the uterus by means of an ingenious and simple plastic repair, carried out entirely by the extraperitoneal approach. It is this feature that renders the method safe even in the hands of a novice. Another asset of the operation is that it can be employed in women of any age, except in very old women with total prolapse, in whom the method of Neugebauer-LeFort is the method of choice. The age of the patients in the present series ranged from 25 to 60. The Fothergill method has its special indications in young women in the reproductive age, with a prolapse requiring surgical intervention. In such cases the problem is solved by varying the size of the vaginal flaps and the extent of the colpoperineorrhaphy. In cases of true hypertrophy or elongation of the cervix, especially when hysterometry shows an excess of 8 cm., with the uterus of normal size, amputation of the cervix is the rule, particularly in the presence of cervicitis.

In the series of 354 patients in which this operation was performed the mortality was nil, and the immediate results very good, with exception of an occasional case, in whom amputation of the cervix was carried out because of profuse hemorrhage. Only 94 of these patients could be followed up. The period of observation ranged from ten months to five years. In 87 or 92.55 per cent of these cases, the results were excellent as regards clinical improvement and absence of recurrence. From the viewpoint of future pregnancies, the Fothergill operation is superior to other methods. Of eight women who became subsequently pregnant, seven delivered spontaneously, and in one prophylactic forceps were applied because of pulmonary tuberculosis.

J. P. GREENHILL

Rutherford, Robert M., M. D.: Presacral Neurectomy, Western J. of Surg. 50: 597, 1942.

A brief history of presacral nerve resection is presented. Emphasis is placed upon the fact that the operation relieves only that pain originating in the uterus, bladder and upper portion of the vagina. The operation is of no value for pain of ovarian or somatic origin. Anatomy of the plexus is described. Since the operation has been recommended primarily for the relief of dysmenorrhea, it is well to keep in mind that the plexus is made up of sensory afferent fibers as well as motor efferent fibers and it is upon the removal of the sensory fibers that the success of the operation depends. Also, interruption of the sympathetic nerve impulses probably brings about dilatation of the vascular supply of the uterus. Since primary dysmenorrhea is thought to be the result of muscular contractions in the presence of ischemia, the dilatation of the vascular system also contributes to pain relief.

The technique of the operation is described in detail and the end results obtained by the author as well as the experience of other investigators are reviewed. Twenty-three cases done by the author's technique gave 100 per cent relief to thirteen cases; 75 per cent to six cases and 50 per cent relief to four cases. Eight of the patients were followed through a pregnancy with no complication which could be attributed to the operation. No change in libido, menstrual flow, bladder or bowel function was observed in these patients.

WILLIAM BICKERS

Solomons, Bethel, M. D.: Abdominal Hysterectomy, Irish. J. M. Sc. 198: 197, 1942.

Dr. Solomons presents a brief review of 790 total and subtotal abdominal hysterectomies done for the most part by himself. The author feels that too many hysterectomies are done, and that this operation should only be performed at or near the menopause. The main indication for operation seems to be hemorrhage, but in cases having myoma he leans to myomectomy rather than the more radical procedure. In discussion of the old question of total versus subtotal hysterectomy, the author takes the sane view of advocating the total operation if disease of the cervix is present. A routine follow-up questionnaire was employed, but inasmuch as only 63 per cent of the patients replied, the author feels that little can be gained from this data. It is certain, in view of the poor follow-up, the avowal of never had an instance of carcinoma of the stump is of little significance. There were 17 deaths in the series, giving an incidence of 2.16 per cent. There was no significant difference in the mortality rate for total and subtotal hysterectomy. There were 2 deaths from embolism, and the statement is made that the use of silk may prevent this accident. A large proportion of the deaths was from shock, and inasmuch as there were no deaths after 1937, one guesses that transfusion has probably been more frequently resorted to.

L. M. HELLMAN

Curtis, Arthur H., M.D., F.A.C.S., Barry, J. Aaron, Ph.D., Ashley, Franklin L., M.D., and Jones, Tom, B.F.A.: The Blood Vessels of the Female Pelvis in Relation to Gynecologic Surgery, Surg., Gynec. & Obst. 75: 421, 1942.

A continuation of a previous study of the anatomy of the female pelvis and peritoneum is herein presented. There are six full-page color plates showing the distribution of injected pelvic vessels. These represent accurate pictures of dissections carried out in planned serial order. The blood vessels, when portrayed in situ, are shown to be arranged in three groups: the vesical, the uterovaginal, and the hemorrhoidal vessels. The point is also made that the so-called ligaments are made up, to a large extent, of arteries and veins.

L. M. HELLMAN

Martzloff, Karl H., M.D.: Routine Abdominal Panhysterectomy, as Prophylaxis Against Cancer of Cervical Stump, Surg., Gynec. & Obst. 75: 628, 1942.

The author takes a conservative stand on the controversial problem of routine panhysterectomy as a prophylactic measure against cancer of the residual cervical stump. A review is given of some of the soundest literature on the subject. The high incidence of stump carcinoma reported by earlier writers is due, in the author's opinion, to cancer already existent at the time of the supravaginal hysterectomy. If three years are allowed to elapse before cases are considered as developing carcinoma in the residual cervix, then the incidence of this type of cancer after subtotal hysterectomy is less than 1 per cent. Total hysterectomy as a routine procedure, except in the hands of well-qualified individuals, has a mortality definitely greater than that encountered in the simple operation. The author does not condemn the procedure when it is undertaken electively by a competent operator on good indication.

L. M. HELLMAN

Bolla, Isidro, M.D., and Bettinotti, Alberto E., M.D.: Contribution to the Surgical Treatment of Stenosis of the Uterine Cervix, An. Inst. de May. y Asist. Soc. 2: 110, 1940.

Isidro Bolla and Alberto E. Bettinotti discuss the evolution of the ideas concerning cervical stenosis in dysmenorrhea and sterility during the last decades and consider the existence of congenital cervical stenosis which justifies surgical treatment.

In their own technique, they make bilateral incisions with straight scissors, sectioning more on the inside than the outside so as to get as near as possible to the internal orifice. They keep the two lips of the incision open by interposing two perforated glass balls, 1 cm. in diameter, kept in place by a horsehair suture which is passed through the tissues and the ball. They call attention to the simplicity and practical advantages of this method and the complete absence of any trouble or complication.

J. P. GREENHILL

Peon, Alberto Rendon, M.D.: Suspension of Uterine Stump by the Round Ligaments in Subtotal Hysterectomies, Rev. de Cir. de Buenos Aires 14: 155, 1942.

Alberto Rendon Peon noted that in many of his first cases of subtotal hysterectomy the uterine stump descended despite the perfect condition of the perineum. This resulted in bladder disturbances, a feeling of vaginal fullness and even lumbar pain, especially in patients who exerted themselves. Since then, he has systematically made the round ligaments contribute to the suspension of the stump. Notwithstanding their thinness (5 to 6 mm. diameter), these ligaments will resist a traction of 500 to 600 Gm., without rupturing. After resection of the uterus and ligation of the ovarian and uterine pedicles, he excises a cone of tissue from the cervical stump,

sufficient to leave an anterior and posterior flexible wall; he detaches the serous covering from these walls and passes through them a No. 2 chromic catgut suture; he adjusts the free extremities of the round ligaments into the concavity of the stump and insures their fixation and hemostasis by tying the catgut. For additional security, when closing the stump he passes the first right and left sutures through the round ligaments. Careful peritonization follows. In this manner, the stump is suspended by six ligaments: three on each side, or four anteroposterior and two antelateroposterior.

J. P. GREENHILL

Gallucci, José: Stenosis of Uterine Cervix, Rev. de gynec. e d'obst. 36: 261, 1942.

José Gallucci states that cervical stenosis is not rare. He has observed four cases. It may be congenital or acquired; the latter is due to many causes, especially to treatment of cervicitis. The clinical forms include adhesion of the canal or the orifices, stricture and agglutination of the orifices by juxtaposition of the cervical mucosa or organization of the normal mucous plug of the cervix. In the anamnesis, previous treatments for cervical discharge must always be inquired into. When a hard, nonelastic and nondilatable cervix is found during labor, it is generally the result of previous electrocoagulation or surgery; sometimes there is no external orifice. In gynecologic cases, there may be sterility associated with amenorrhea; obstructive dysmenorrhea which improves with dilatations; purulent discharge without apparent cause, especially in menopausal women; primary amenorrhea in congenital stenosis, and secondary amenorrhea in acquired stenosis; collection of blood in the cervix, uterus, tubes and peritoneum, but mostly only in the uterus.

If the stenosis is discovered during labor, the cervix is incised and delivery completed by an appropriate obstetrical maneuver. If it is diagnosed at another time, dilatation with Hegar dilators may be considered and should always be used after treatment of cervicitis; amputation of the cervix, using Sturmdorf's method, may be performed in young women, or hysterectomy in menopausal patients.

Of the author's three personal cases, two were the result of radium applications for cervical cancer and one was due to traumatism of labor: As this woman was 41, high amputation of the cervix was performed. The fourth case, seen in another clinic, was discovered during premature labor in a woman who had been treated for cervicitis; incision of the cervix and forceps application solved the difficulty.

J. P. GREENHILL

Stajano, Carlos, and Schaffner, Eduardo: Bilateral Oophorectomy in Trophic Neurosis of Vulva, Bol. Soc. de obst. y ginec. de Buenos Aires 21: 183, 1942.

Carlos Stajano and Eduardo Schaffner state that most neurotrophic disorders of the vulva, such as essential pruritus, recurrent chronic eczema, leukoplakia, kraurosis, etc., appear about and after the menopause. For years, the authors tried unsuccessfully to cure these disorders with ovarian extracts, especially estrogen. Then they discovered accidentally the noxious action of senile ovaries when they saw rebellious vulvar lesions undergo favorable changes after castration of old women for uterine lesions. Essential pruritus that has been present for years disappears immediately after the operation. Leukoplakia, associated or not with pruritus, regresses and the vulva may assume a normal aspect in a few weeks.

Many patients were between 60 and 75; they had atrophic and sclerosed ovaries, the removal of which cured pruritus always and leukoplakia frequently. The authors confirm their former concept that the ovary produces morphogenetic hormones, and they add to the syndromes of ovarian hyperfunction and insufficiency that of dysfunction under the term of "toxic ovary."

J. P. GREENHILL

Correspondence

Relaxation of Bandl's Contraction Ring With Adrenalin Chloride

To the Editor:

Since Rucker's Communication in the *Southern Medical Journal* (18: 412, 1925) the fact that adrenalin relaxes constriction rings has been quite widely held. However, the opponents to such belief maintain that the clinical effects noted after administering adrenalin hypodermically have been due to deepening of the anesthesia at the time. Even as recently as the April, 1943, issue of the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*, Brown and Wilder make such a statement. So far as I know, no observations have been made of the patient under spinal anesthesia which is uniform in its effect, and therefore, not open to the objection mentioned. This case, therefore, seems worthy to be reported.

A twenty-three-year-old primigravida whose history was essentially negative was admitted to Park View Hospital after being in active labor for more than twenty-eight hours. The fetal head was not engaged and the cervix was undilated. A cesarean section was decided upon and spinal anesthesia used. When the uterus was exposed both the operator, Dr. N. P. Battle, and I noticed a distinct hourglass contraction of the uterus which had not been relaxed by the anesthesia. The constriction ring was about the baby's neck. Five minims of adrenalin chloride was given hypodermically in the deltoid muscle and within three minutes the ring had completely disappeared.

ROCKY MOUNT, N. C.

ADAM T. THORP, M.D.

JULY 30, 1943.

Item

American Board of Obstetrics and Gynecology, Inc.

Examinations

The next written examination and review of case histories (Part I) for all candidates will be held in various cities of the United States and Canada on Saturday, February 12, 1944 at 2:00 P.M. Candidates who successfully complete the Part I examination proceed automatically to the Part II examination held later in the year. All applications must be in the office of the Secretary by November 15, 1943.

All candidates are now required to have been out of medical school not less than eight years, and in that time to have completed an approved one year internship and at least three years of approved special formal training, or its equivalent, in the seven years following the intern year. This Board's requirements for internships and special training are similar to those of the American Medical Association since the Board and the A.M.A. are at present cooperating in a survey of acceptable institutions. At the last Board meeting held May, 1943, it was decided to give special credit for certain types of military service. All candidates must be full citizens of the United States or Canada before being eligible for admission to examinations.

All candidates will be required to take the Part I examination, which consists of a written examination and the submission of twenty-five (25) case history abstracts, and the Part II examination (oral-clinical and pathology examination). The Part I examination will be arranged so that the candidate may take it at or near his place of residence, while the Part II examination will be held late in May, 1944, in that city nearest to the largest group of candidates. Time and place of this latter will be announced later.

For further information and application blanks, address Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh (6), Pennsylvania.

PAUL TITUS, M.D.

Secretary.

September 17, 1943.